

Hurricane Matthew and Typhoon Chaba

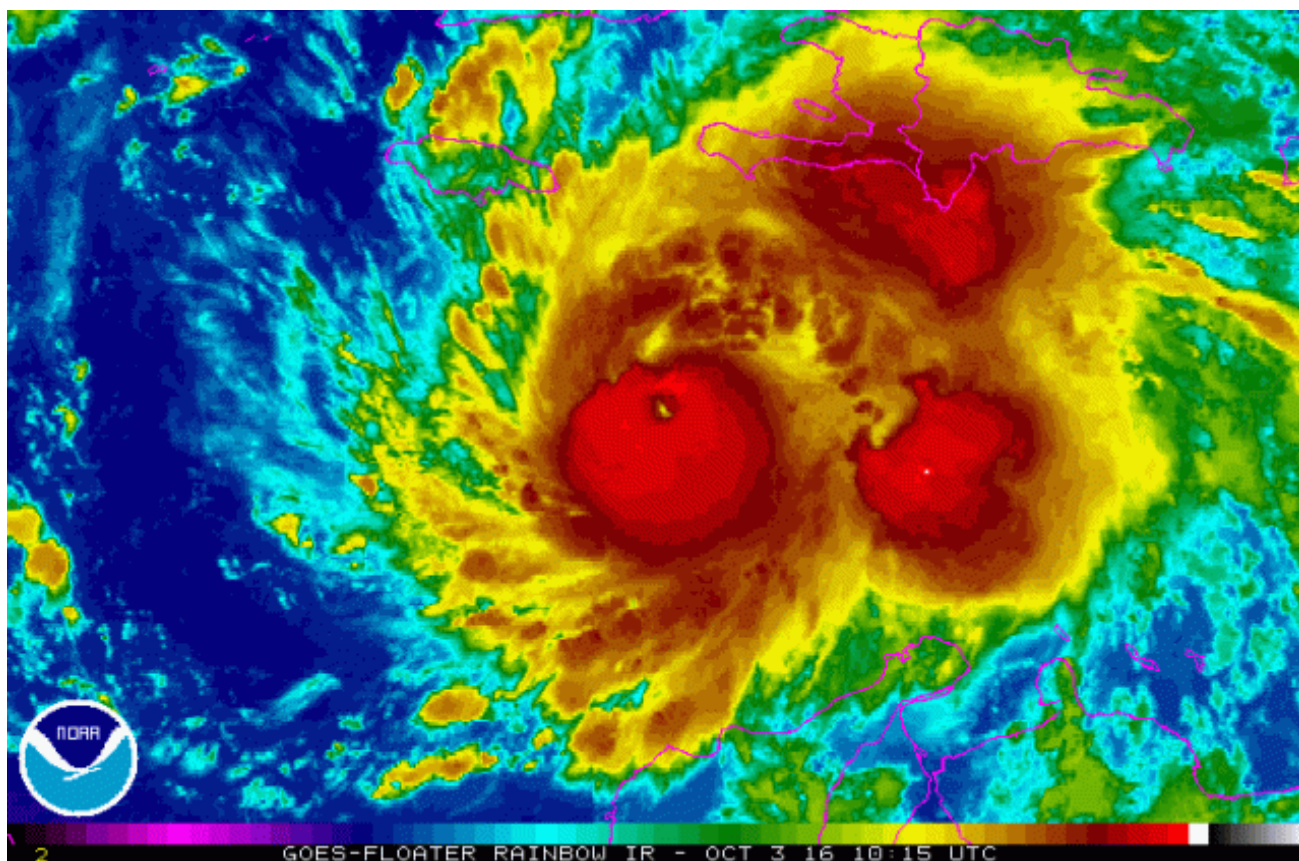
Description

Over the weekend [Hurricane Matthew](#) made headlines as it became the first hurricane in the Atlantic or Caribbean to reach category 5 on the [Saffir-Simpson Hurricane Wind Scale](#) since Felix in 2007. Although its intensity soon dropped back slightly, it is still maintaining category 4 strength with sustained winds currently near 130 mph.

Matthew is moving slowly northwards in the Caribbean Sea with the eye expected to move over or just to the west of the western tip of Haiti on Tuesday. However, in advance of this bands of heavy rain are already moving across Haiti, the Dominican Republic and Jamaica. Rainfall totals of 400-600 mm are likely in many areas with 1000 mm possible in isolated locations. This is likely to cause flash flooding and mudslides. Coastal areas in the region will also see a storm surge of 1-2 metres widely with 4-5 metres possible in some locations.

The last hurricane to directly impact Haiti was Tomas in 2010. Tomas caused flooding, property damage and some loss of life, although was less intense than Matthew is expected to be at its closest approach to the country.

Matthew is expected to remain a 'major' hurricane (at least category 3) as it crosses eastern Cuba and the southern Bahamas by mid-week. Beyond that there is some uncertainty as to the track of Matthew. The latest consensus of forecasts is that the centre of the hurricane will stay offshore of the USA, but at this stage landfall cannot be completely ruled out.



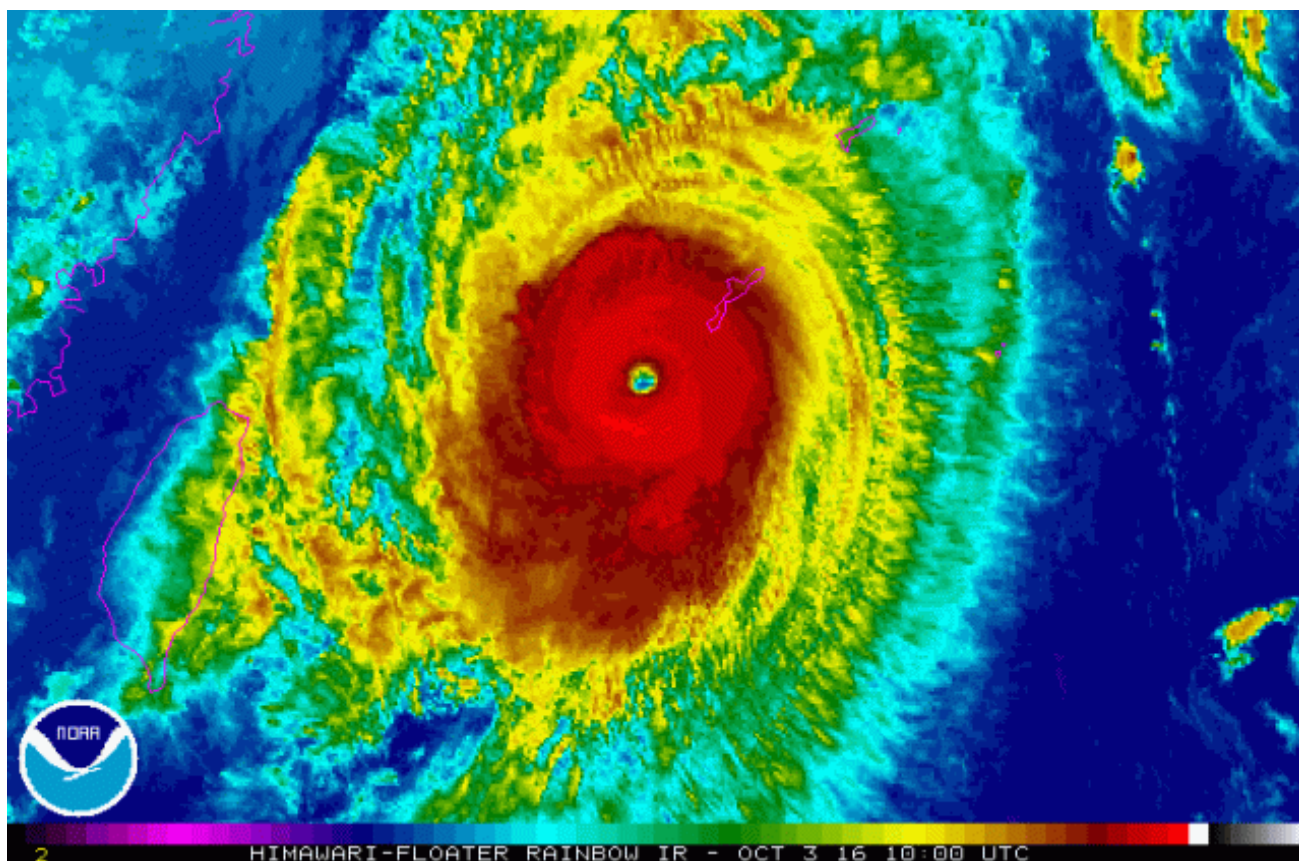
Hurricane Matthew south of Haiti and Jamaica on 3 October 2016 . Image courtesy of NOAA

Since high pressure is set to dominate the UK weather for at least the next week, no direct impacts of Matthew on the UK are expected at this time.

Typhoon Chaba

Whilst attention has been focused on Hurricane Matthew, Typhoon Chaba has been strengthening in the western Pacific and is now a stronger tropical cyclone than Matthew having just attained category 5 status on the [Saffir-Simpson Hurricane Wind Scale](#).

Chaba is expected to pass to the west of the Japan's Okinawa Island today, but could pass directly over the smaller island of Kume which has about 8000 residents. As is often the case with tropical cyclones of this strength and size, storm surge and rainfall of several hundred millimetres is likely to accompany the exceptionally strong winds near the centre of the typhoon.



Typhoon Chaba seen southwest of Okinawa Island on 3 October 2016. Image courtesy of NOAA

The latest forecast track takes Chaba north then northeast. It is likely to pass very close to south-western Japan and South Korea on Tuesday and Wednesday. Japan in particular could see some large rainfall totals with the risk of flooding as Chaba moves along the length of the country during mid-week.

Official warnings for the latest tropical cyclones in the western North Pacific are produced by the [Japan Meteorological Agency](#). North Atlantic warnings are issued by the US [National Hurricane Center](#). The Met Office routinely supplies predictions of cyclone tracks from its global forecast model to regional meteorological centres worldwide, which are used along with guidance from other models in the production of forecasts and guidance. We also provide updates on current tropical storms via [@metofficestorms](#) on Twitter.

Date Created
October 2016

The latest on Hurricane Matthew and Typhoon Chaba

Description

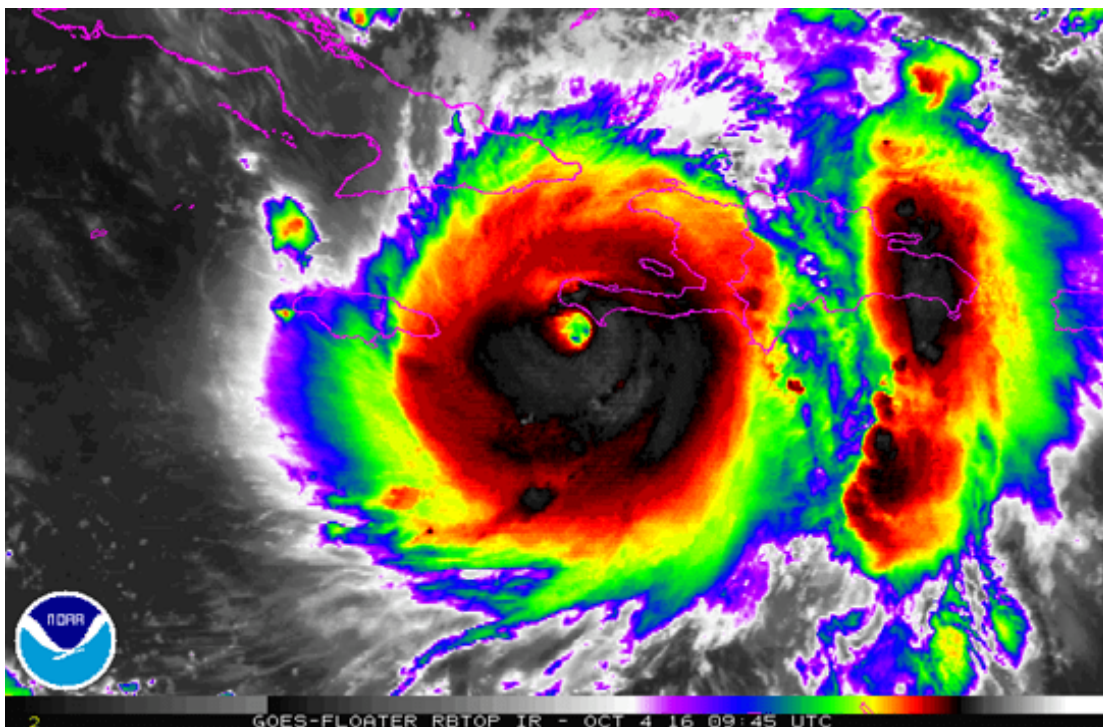
Hurricane Matthew

Hurricane Matthew has strengthened slightly as it has tracked slowly north towards Haiti. It is making landfall over the southwestern tip of Haiti as a category 4 hurricane on the [Saffir-Simpson Hurricane Wind Scale](#) with sustained winds near 145 mph. This makes it the strongest hurricane to make landfall over Haiti since Hurricane Cleo in 1964. In 1980 Hurricane Allen was a similar intensity as it passed close to Haiti, although the eye just kept offshore.

In addition to exceptionally strong winds near the centre, Matthew is expected to bring a storm surge of 2-3 metres to the coast of Haiti, the Dominican Republic and Cuba. Rainfall totals of 500 mm are widely expected and up to 1000 mm in mountainous areas. This is likely to result in severe flooding.

Matthew will pass over the eastern tip of Cuba later today and is then expected to take a leftward turn and start tracking across the Bahamas. Although it may weaken to category 3, it will still be a powerful hurricane and could bring a storm surge over many of the islands of 3-4 metres.

In the longer range there is now an increasing likelihood that Matthew will affect Florida and other parts of the USA east coast late in the week and over the weekend. If and when the eye of the hurricane makes landfall is still uncertain, but even if it is a glancing blow impacts can be expected from strong winds, heavy rain, storm surge and rough seas.



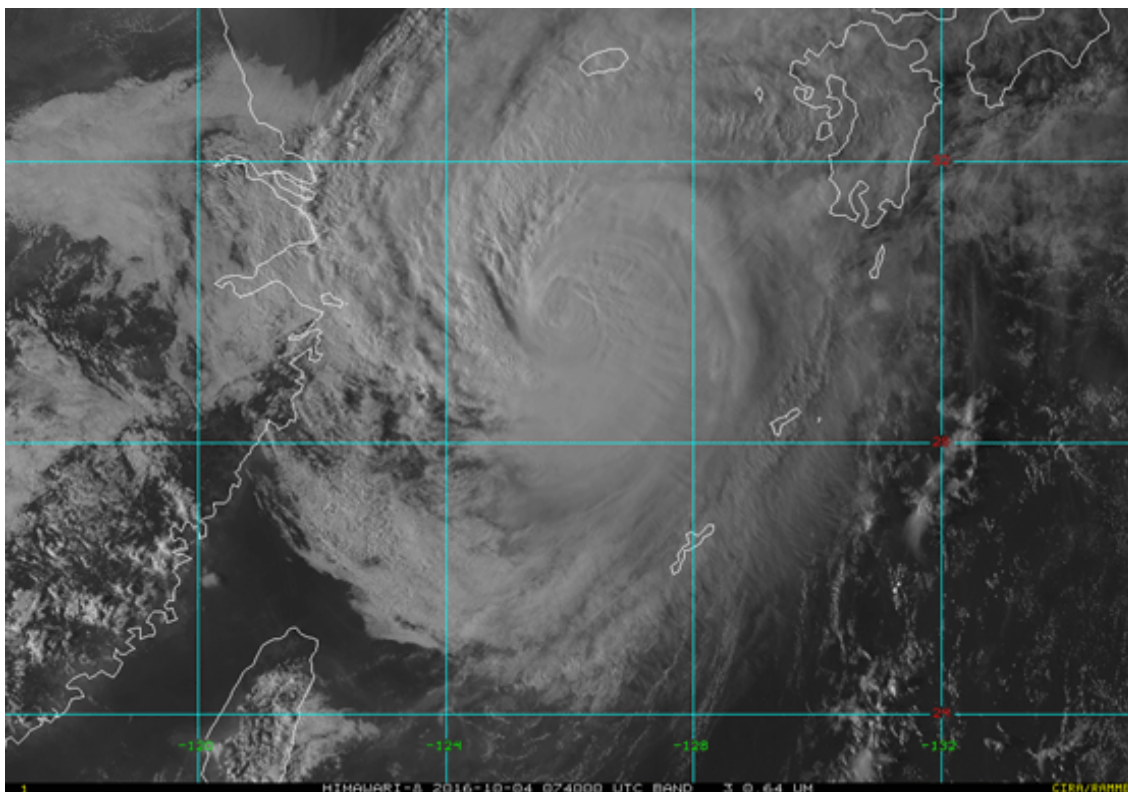
Hurricane Matthew making landfall over Haiti on 4 October 2016 (credit: NOAA)

On the other side of the Atlantic, with high pressure dominating the UK weather for at least the next week, Matthew is not currently expected to have any direct impacts on the UK.

Typhoon Chaba

Yesterday Typhoon Chaba peaked at category 5 on the [Saffir-Simpson Hurricane Wind Scale](#) as it passed across the Ryukyu Islands in the western Pacific. Although the eye passed just to the west of Kume Island, a wind gust of 134 mph was recorded.

Chaba is continuing to track north with only slight weakening. It is expected to turn northeast and could pass over the Korean island of Jeju later today. The southern coast of mainland South Korea is also likely to see some impacts. It is then likely to accelerate along the northern coast of Japan, bringing a spell of heavy rain as it does so.



Typhoon Chaba seen southwest of Japan on 4 October 2016. (credit: CIRA/AMMB)

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Hurricane and tropical storm update

Description

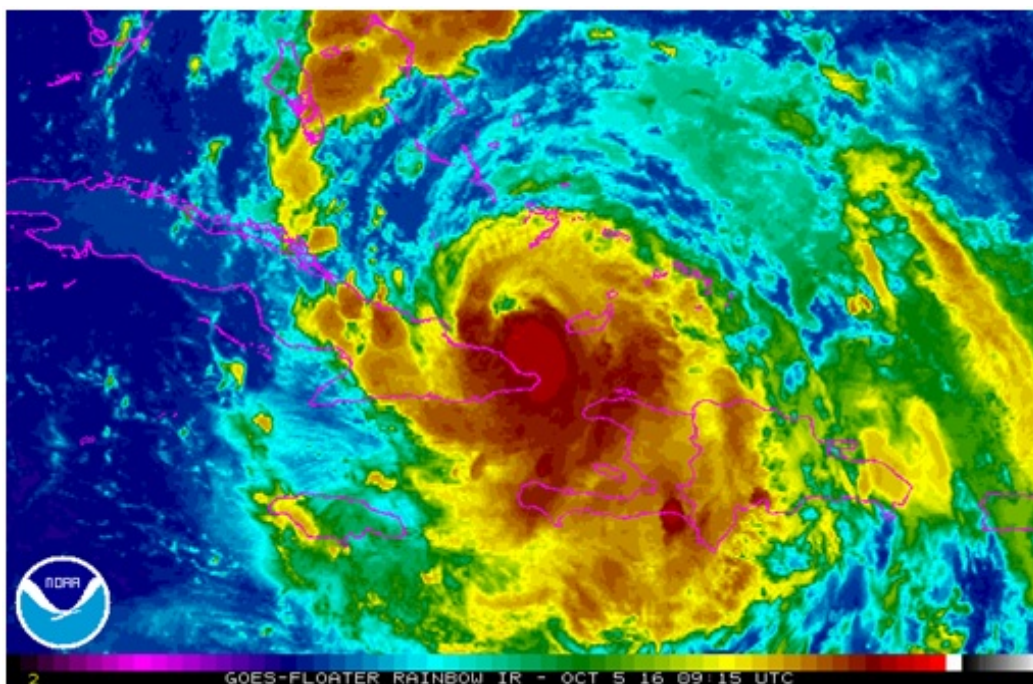
Hurricane Matthew

Hurricane Matthew made landfall over the south-west of Haiti yesterday as a Category 4 hurricane on the [Saffir-Simpson Hurricane Wind Scale](#) with sustained winds near 145 mph. It was the strongest hurricane to make landfall over Haiti since Hurricane Cleo in 1964. Approximately 12 hours later it made landfall over the eastern tip of Cuba. Interaction with the land masses of Hispaniola and Cuba has weakened Matthew slightly, but it is still a Category 3 hurricane, with winds near 125 mph.

Matthew is now expected to turn north-west and track through the Bahamas today and Thursday. Matthew may strengthen as it moves over very warm water. A storm surge of two to three metres is expected widely, with four metres possible in some locations.

Hurricane warnings and watches are in effect for much of the east coast of Florida. It is likely the eye of Hurricane Matthew will pass very close to the entire eastern coastline of the US state on Friday. Whether Matthew actually makes landfall is uncertain, but this cannot be ruled out. Even without landfall, strong winds, heavy rain and storm surges are expected. The last major hurricane (Category 3 or stronger) to make landfall over the US coast was Wilma in 2005.

Over the weekend it is expected that Matthew will weaken and turn north and northeast and affect the coastal areas of Georgia and the Carolinas. However, this is the point at which uncertainty grows in forecasts. It is looking increasingly likely that later in the weekend Matthew will turn out to sea, but the timing of this cannot be stated with certainty. Thus it is unclear how far north along the US coast will see impacts from Matthew.



Hurricane Matthew on 5 October 2016 (credit: NOAA)

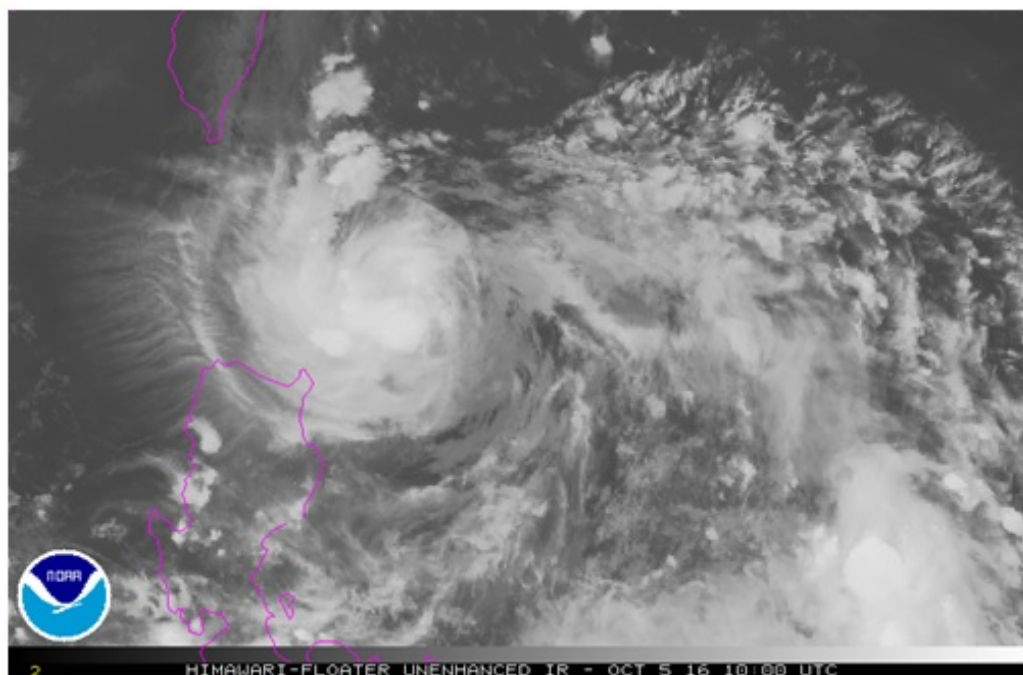
Tropical Storm Nicole

Yesterday Tropical Storm Nicole formed in the open ocean of the Atlantic well to the north of the Leeward Islands. At this stage Nicole is not expected to strengthen rapidly and is likely to meander for several days without affecting land. Initially, no interaction with Hurricane Matthew is expected, but it is possible that in the longer term there may be some interaction. How this affects the track of each storm is uncertain at this time.

Typhoon Chaba and a west Pacific tropical depression

Typhoon Chaba passed over the Korean Island of Jeju yesterday bringing near to 250mm rain. It has now weakened to a tropical storm and is racing north-eastwards, just north of Japan. It is sparking heavy showers and some longer spells of rain, but no significant impacts are expected.

Also in the western North Pacific, a tropical depression has formed to the north-east of the Philippines. This could become a tropical storm as it moves westwards through the Luzon Strait. It is likely to track into the South China Sea and could threaten southern coastal areas of China, but the detail of any landfall is uncertain at present.



A tropical depression seen north-east of the Philippines on 5 October 2016. (credit: NOAA)

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Latest News on Hurricane Matthew and other Tropical Cyclones

Description

Hurricane Matthew

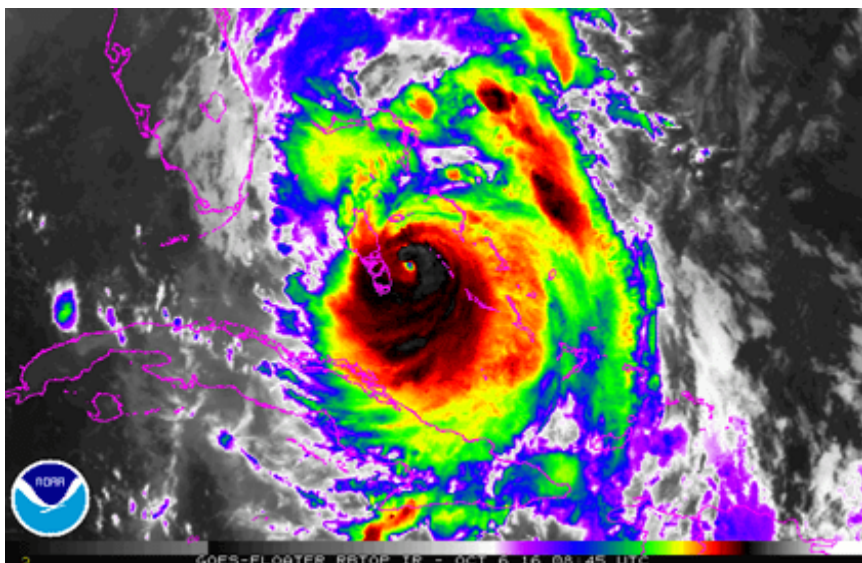
Hurricane Matthew's passage across Cuba and Hispaniola resulted in some weakening, although it retained its status as a 'major' (category 3 or greater) hurricane, which it has now held for almost six days. No other Atlantic hurricane in the month of October has been a major hurricane as long as this since 1963.

Matthew is now moving through the Bahamas and is strengthening again. Sustained winds are currently near 125 mph and the hurricane is on the cusp of regaining category 4 status on the [Saffir-Simpson Hurricane Wind Scale](#). On its current track the eye of Matthew will pass over or just to the west of Nassau, the capital of the Bahamas in the next few hours. This is likely to cause severe wind damage and a storm surge of up to 4.5 metres is possible.

Next in line for Matthew's fury is Florida on Friday. The eye of the hurricane is expected to track along or very close to the east coast resulting in extreme winds, storm surge and heavy rain. It is possible that the eye will stay just offshore, which would mean that Matthew does not technically make landfall. However, the impacts are still likely to be severe for coastal regions even if this happens.

In the longer range Matthew will head towards Georgia and South Carolina, but is then expected to turn east and drift out to sea. There is high uncertainty in the movement of Matthew early next week. It may stay out at sea and slowly weaken, but there is a possibility that it will make a clockwise loop and head towards Florida or the Bahamas again. It will be a day or two before forecasts this far ahead become more certain.

Given the likelihood that Matthew will stay in the western Atlantic close to the USA for many days to come and a blocking area of high pressure over northern Europe is dominating the UK's weather at present, Matthew is not likely to have any impact on the UK weather.



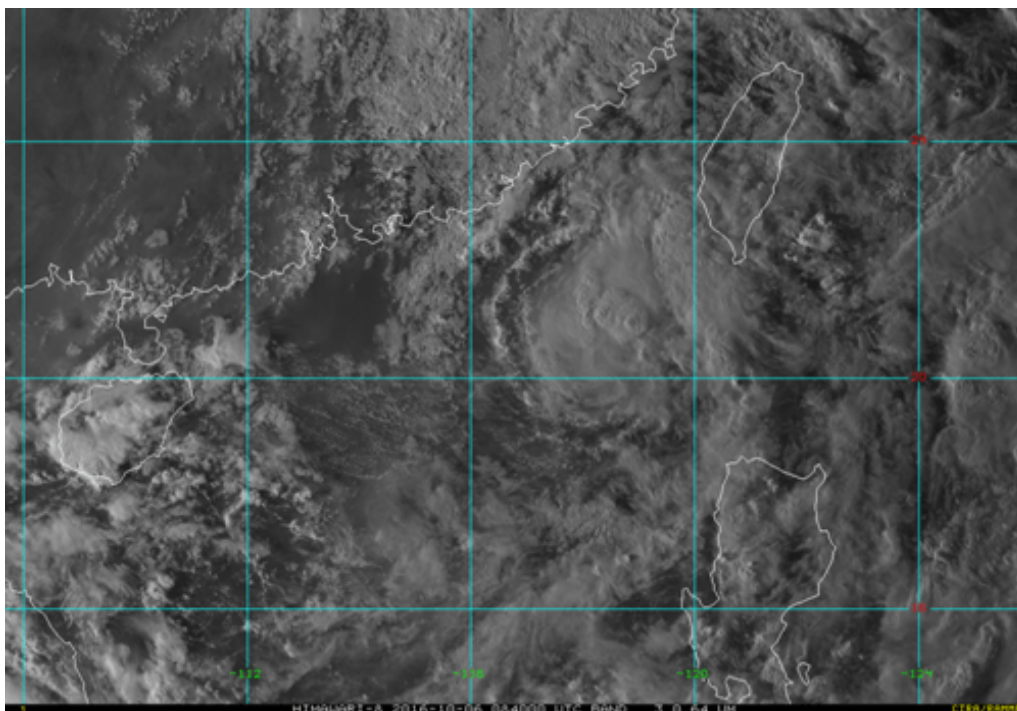
Hurricane Matthew just south of Nassau in the Bahamas on 6 October 2016 (credit: NOAA)

Tropical Storm Nicole

Tropical Storm Nicole is lurking to the east of Hurricane Matthew in the open waters of the Atlantic. It is currently just below hurricane strength. Although Nicole does not immediately threaten any land areas, the storm could play an important role in determining the track of Matthew next week. The two storms may interact and either rotate around each other or Nicole could be absorbed into Matthew. Alternatively the two could remain sufficiently far apart to not interact. At the moment either of these scenarios is possible.

Elsewhere in the world

Tropical Storm Aere has formed just to the north of the Philippines and is moving westwards into the South China Sea. Although weak at the moment, Aere could become a typhoon and threaten parts of southern China including Hong Kong and Hainan Island.



Tropical Storm Aere on 6 October 2016. (credit: CIRA/AMMB)

Finally, a subtropical storm named Bransby has developed in the south Indian Ocean to the south of Madagascar. It is not forecast to affect any land areas as it moves south-eastwards in the next few days.

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What next for Hurricane Matthew?

Description

Yesterday Hurricane Matthew strengthened to category 4 on the [Saffir-Simpson Hurricane Wind Scale](#) as it crossed the Bahamas. The eye of the hurricane passed just west of Nassau between New Providence and North Andros islands. Later in the day it passed over Freeport on Grand Bahama. Peak wind strengths at that time were estimated to be near 140 mph.

Matthew is now [tracking](#) very close to the Florida coast. Although strong winds and heavy rain are being experienced, the eye and thus the strongest winds are currently remaining just offshore. In recent hours a process known as an eyewall replacement cycle has been occurring. This means an inner small eye with very strong winds around it is replaced by a much wider eye with slightly less strong winds. Although the peak wind strength reduces during this process the area covered by strong winds can expand. Hurricane force winds are very close to the coast of Florida and the outer eyewall of Matthew is touching Cape Canaveral. A wind gust of 107 mph was recently recorded.

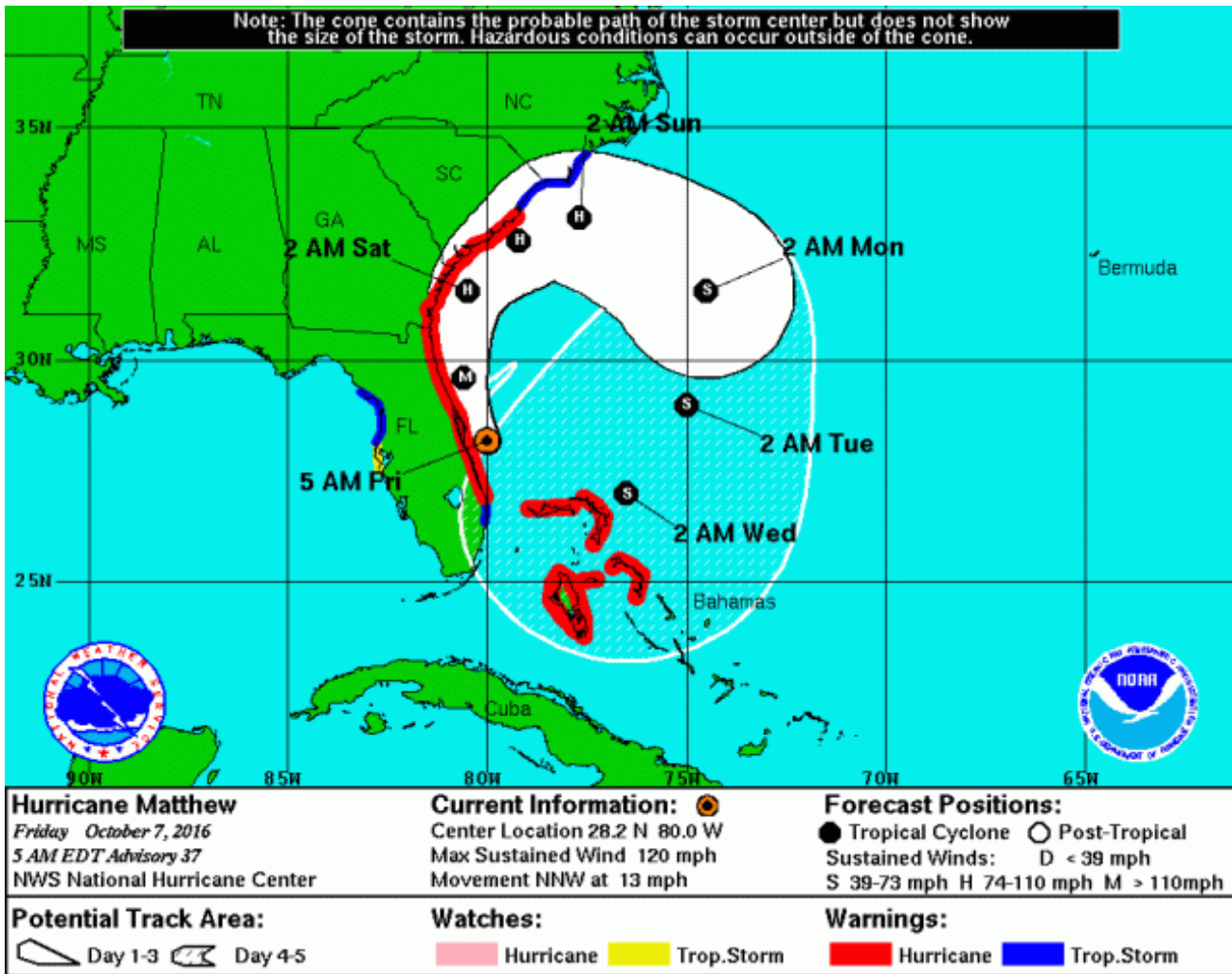


Hurricane Matthew rainfall radar image on 7 October 2016 (credit: NOAA)

The hurricane is expected to continue tracking up the coast of Florida today and then start to bend to the right as it approaches the coast of Georgia and South Carolina. It is possible that the eye could remain just offshore which would mean Matthew technically does not make landfall over the USA. However, coastal areas of all three states are still likely to see impacts from strong winds, heavy rain and storm surge. Rainfall totals of up to 300-500 mm are possible with a storm surge of 1-3 metres in many places.

In the longer term Matthew will turn eastwards into the Atlantic Ocean and start to weaken. There is considerable uncertainty as to the track beyond this weekend, but it is possible a weakened Matthew will loop southwards and move back towards the USA or Bahamas.

Given the likelihood that Matthew will stay in the western Atlantic close to the USA for many days to come and a blocking area of high pressure over northern Europe is dominating the UK's weather at present, Matthew is not likely to have any impact on the UK weather.



Latest National Hurricane Centre forecast track for Hurricane Matthew. Image courtesy of NOAA.

Hurricane Nicole

Nicole strengthened into a hurricane yesterday and is located in the Atlantic Ocean to the east of Matthew. It is expected to move slowly and erratically for the next few days. Some interaction with Matthew is possible in a few days time which increases the uncertainty in the forecast track of both hurricanes.

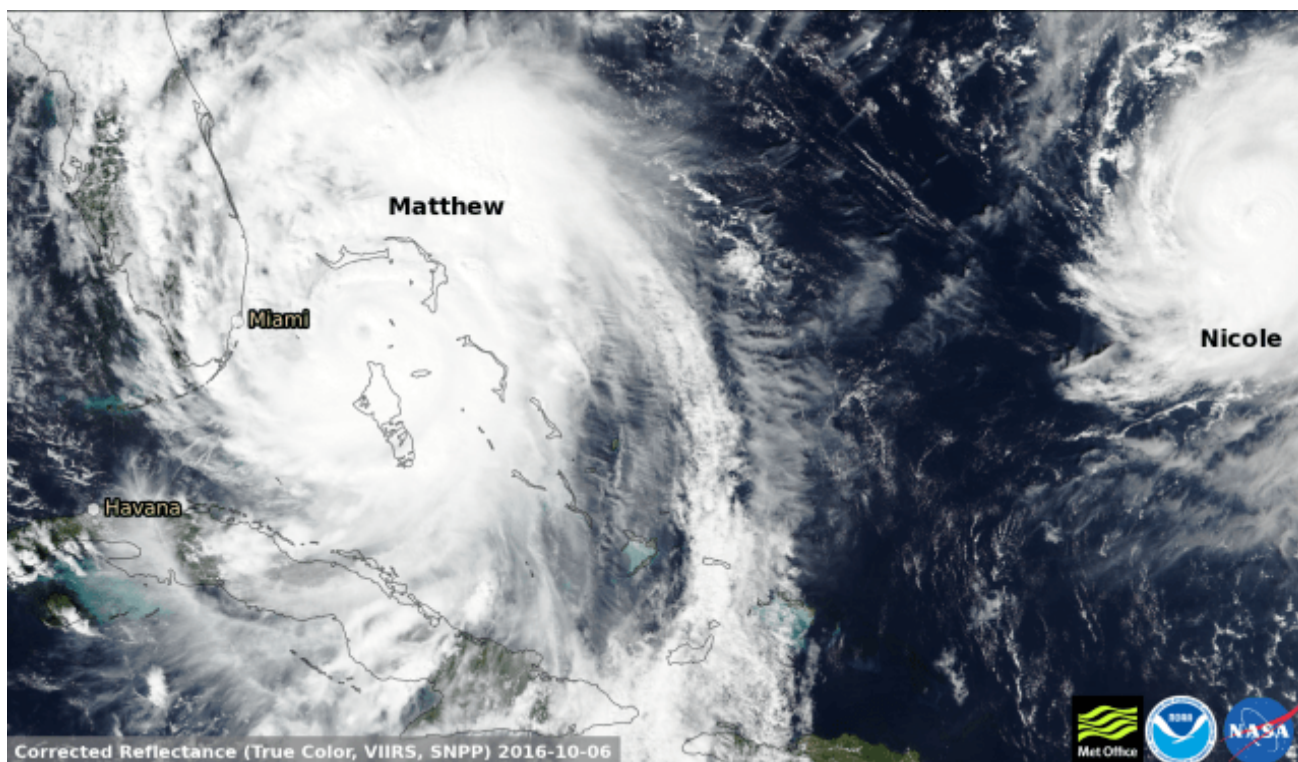


Image courtesy of NOAA and NASA

Elsewhere in the world

Tropical Storm Aere is currently located to the south-east of Hong Kong. It may strengthen to a typhoon and is forecast to move very slowly just offshore of southern China. At this stage it is difficult to say whether any land areas will be directly affected.

Another tropical storm is expected to develop soon in the western North Pacific, but well away from land. Even if the storm develops and becomes a typhoon interaction with land looks unlikely based on latest forecasts.

Further Information

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The latest on Hurricane Matthew

Description

Hurricane Matthew has continued to slowly weaken and is currently a category 2 on the [Saffir-Simpson Hurricane Wind Scale](#). [Matthew](#) is expected to move north, then northeast through the rest of Saturday along the coast of South Carolina, before turning east into the North Atlantic during Sunday.

Despite not quite making landfall Matthew caused extensive flooding from a combination of storm surge and torrential rain along central and northern parts of the Florida east coast. Daytona Beach, Augustine and Jacksonville have been particularly hard hit.

As a category 2 hurricane Matthew still has winds of around 105 mph and could just make landfall over South Carolina before moving back over water later. Regardless of whether Matthew makes landfall or not, damaging hurricane-force winds are likely in coastal parts of South Carolina and possibly North Carolina later today.

Coastal areas of North and South Carolina are likely to experience significant impacts from Matthew. Rainfall totals of 200-400mm, combined with storm surge will bring severe flooding.

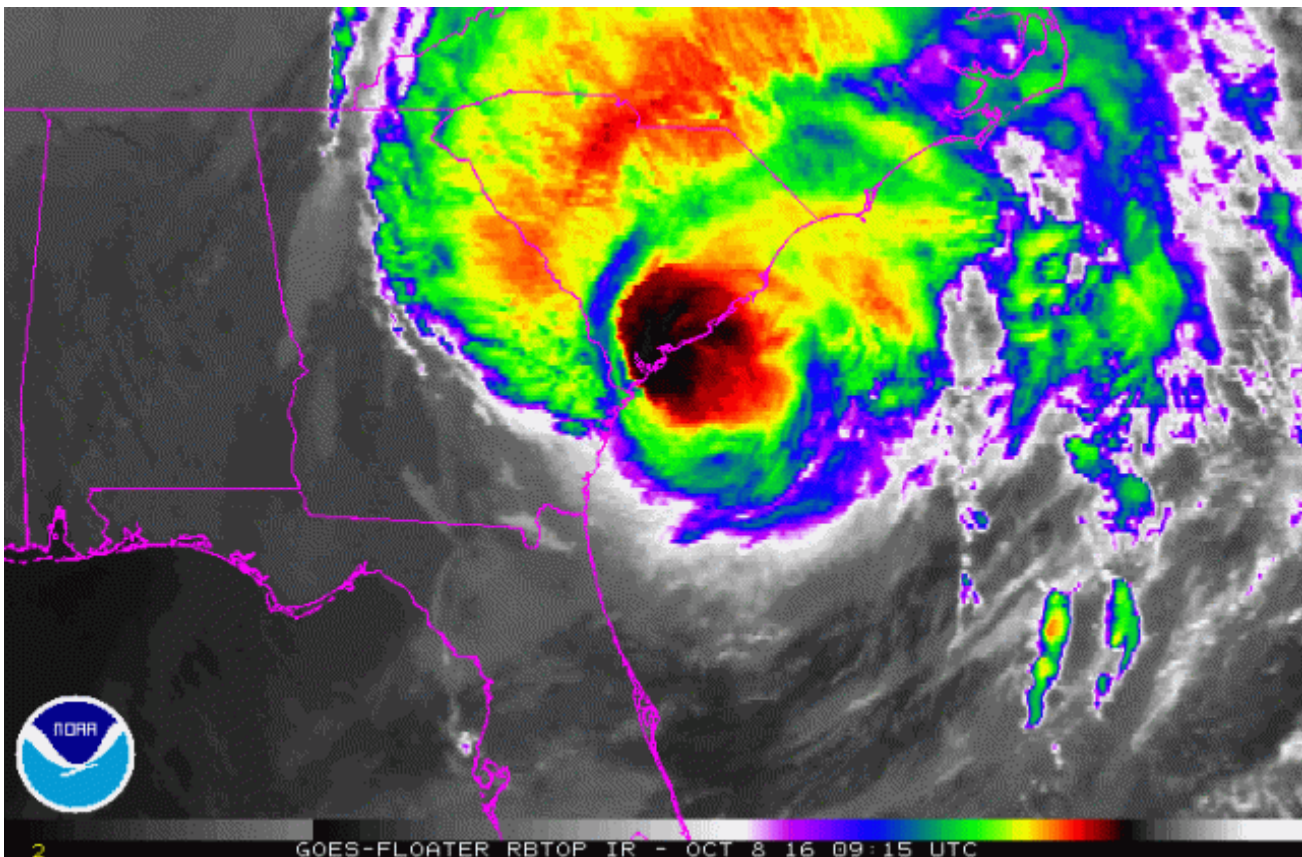


Image courtesy of NOAA

Once Matthew moves out to sea later on Sunday (09/10/16) the track the storm subsequently takes remains considerably uncertain. Currently the official forecast still shows a turn southwards as Matthew weakens, perhaps eventually bringing more heavy rain to Bahamas by the middle of next week. However other possible scenarios include Matthew interacting with Tropical Storm Nicole and eventually turning north or northeast.

Similarly the future track of Nicole is uncertain, but there could be a potential threat to Bermuda later next week.

Given Matthew did not make landfall at category 3, Wilma (2005) is the last major hurricane to make landfall in the US.

Elsewhere in the world

Tropical Storm Aere is currently located to the south-east of Hong Kong. It is forecast to move very slowly just offshore of southern China. At this stage it is difficult to say whether any land areas will be directly affected.

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The latest on Hurricane Matthew

Description

Hurricane Matthew has weakened over the past 24 hours and is now a category 1 hurricane with sustained winds of 75 mph and is [currently centred](#) just off the South Carolina coast.

Matthew made landfall just to the north-east of Charleston, South Carolina on Saturday bringing with it widespread and locally record breaking flooding and destructive winds overnight. Savannah International Airport recorded 264 mm of rainfall, and there are reports of as much as 450 mm (17.5 inches) in some places. Norfolk, Virginia, reported 103 mm in just 6 hours this morning.

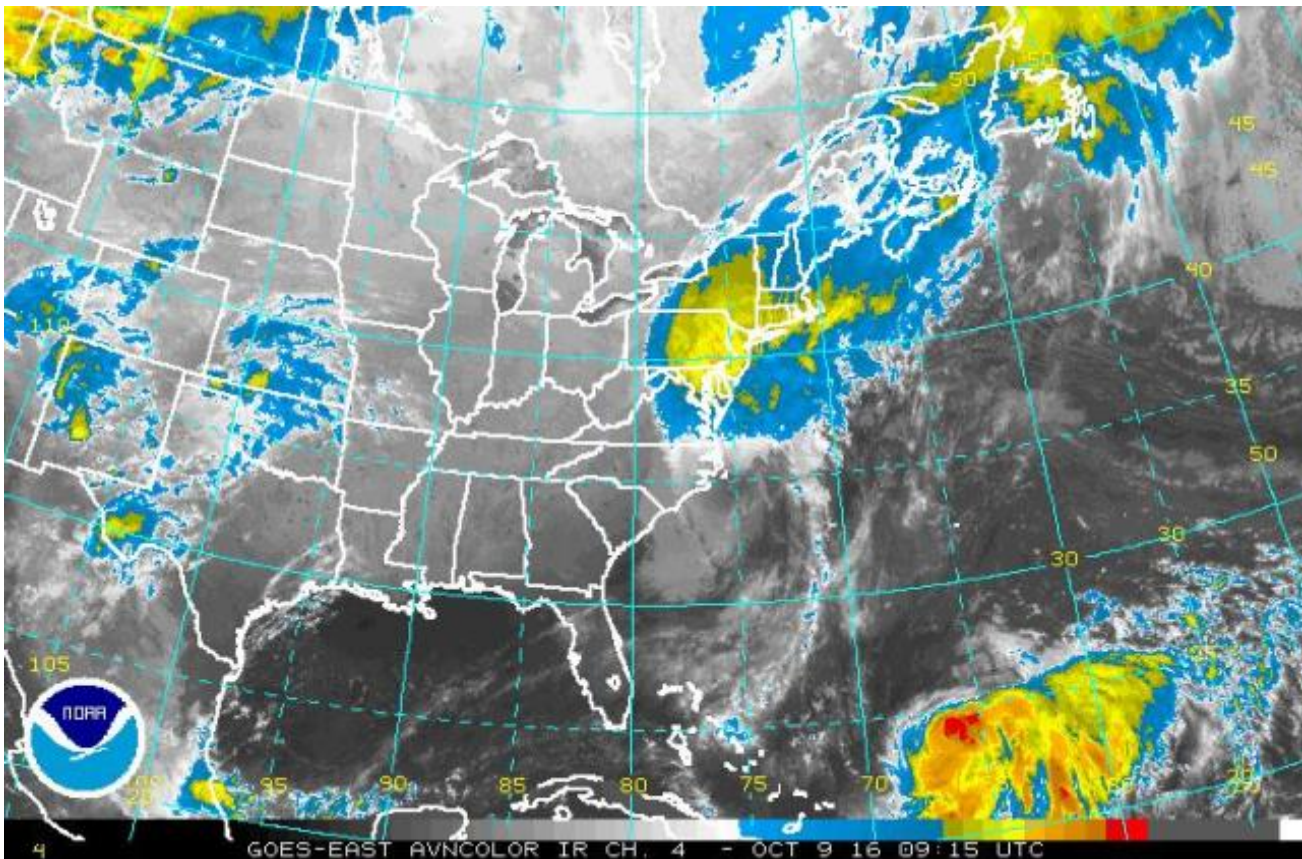


Image courtesy of NOAA

Matthew is currently offshore and expected to turn east into the Atlantic Ocean today weakening further. However it could still bring some damaging winds and a further 200-300 mm, locally 500 mm of rainfall to parts of North Carolina and Virginia.

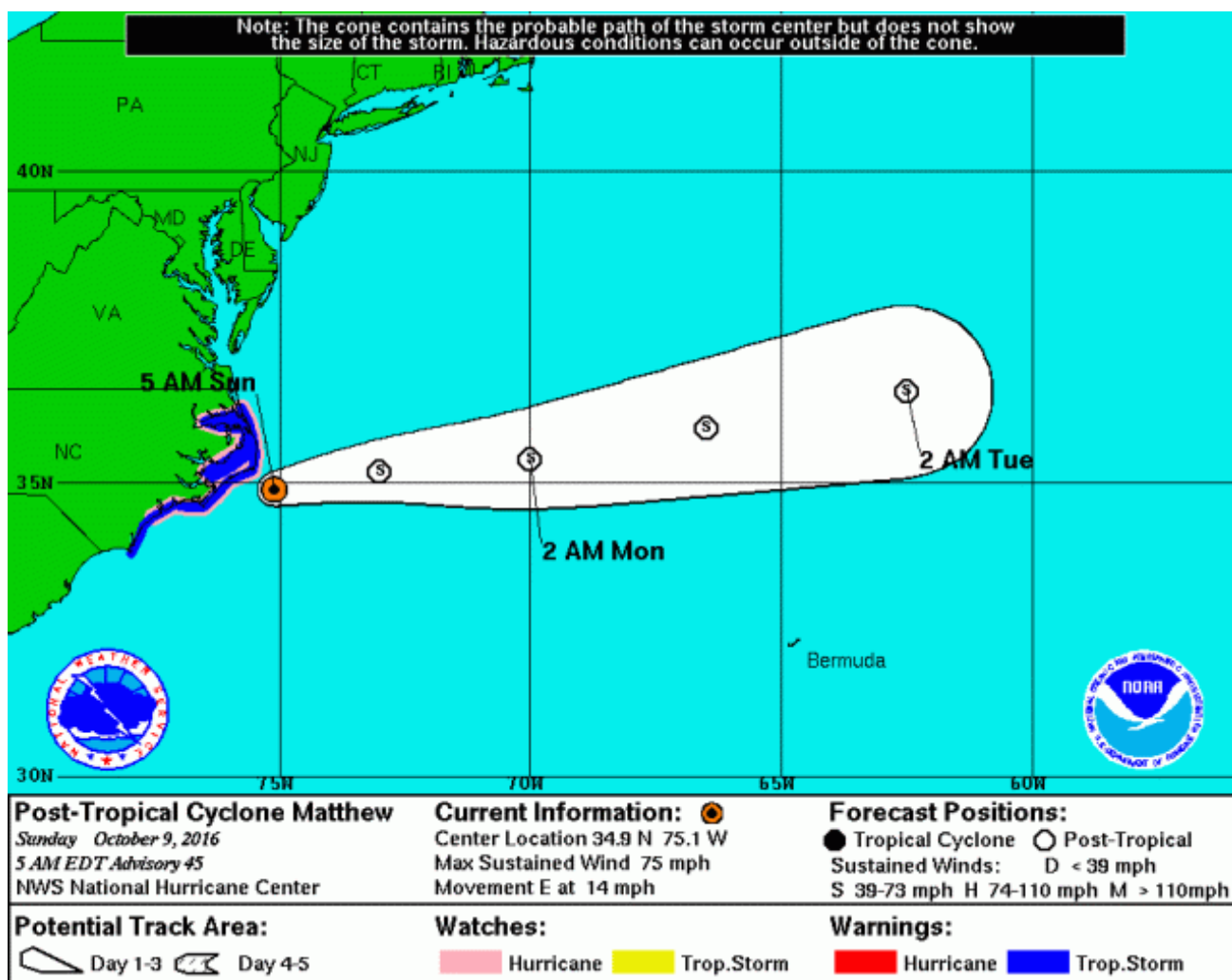


Image courtesy of NOAA

There remains some uncertainty as to the eventual fate of Matthew, however it now looks increasingly likely that the [post-tropical](#) remains of the storm will be absorbed by a [frontal](#) system on Monday or Tuesday. It is looking unlikely it will interact with Tropical Storm Nicole or re-affect the Bahamas later this week.

The death toll in Haiti due to the effects of Matthew is now almost 900, with an estimated 350,000 people in need of assistance. There are currently reports of 10 deaths in the US as a result of Hurricane Matthew.

Elsewhere in the world

Tropical Storm Aere is currently almost stationary in the South China Sea, around 200 miles Southeast of Hong Kong. The storm is likely to remain slow moving for another 24 hours or so. Aere is likely to bring some heavy rain to southernmost parts of Guangdong, possibly also to Hong Kong and Hainan early next week.

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Matthew, Nicole and other tropical cyclones worldwide

Description

Hurricane Matthew

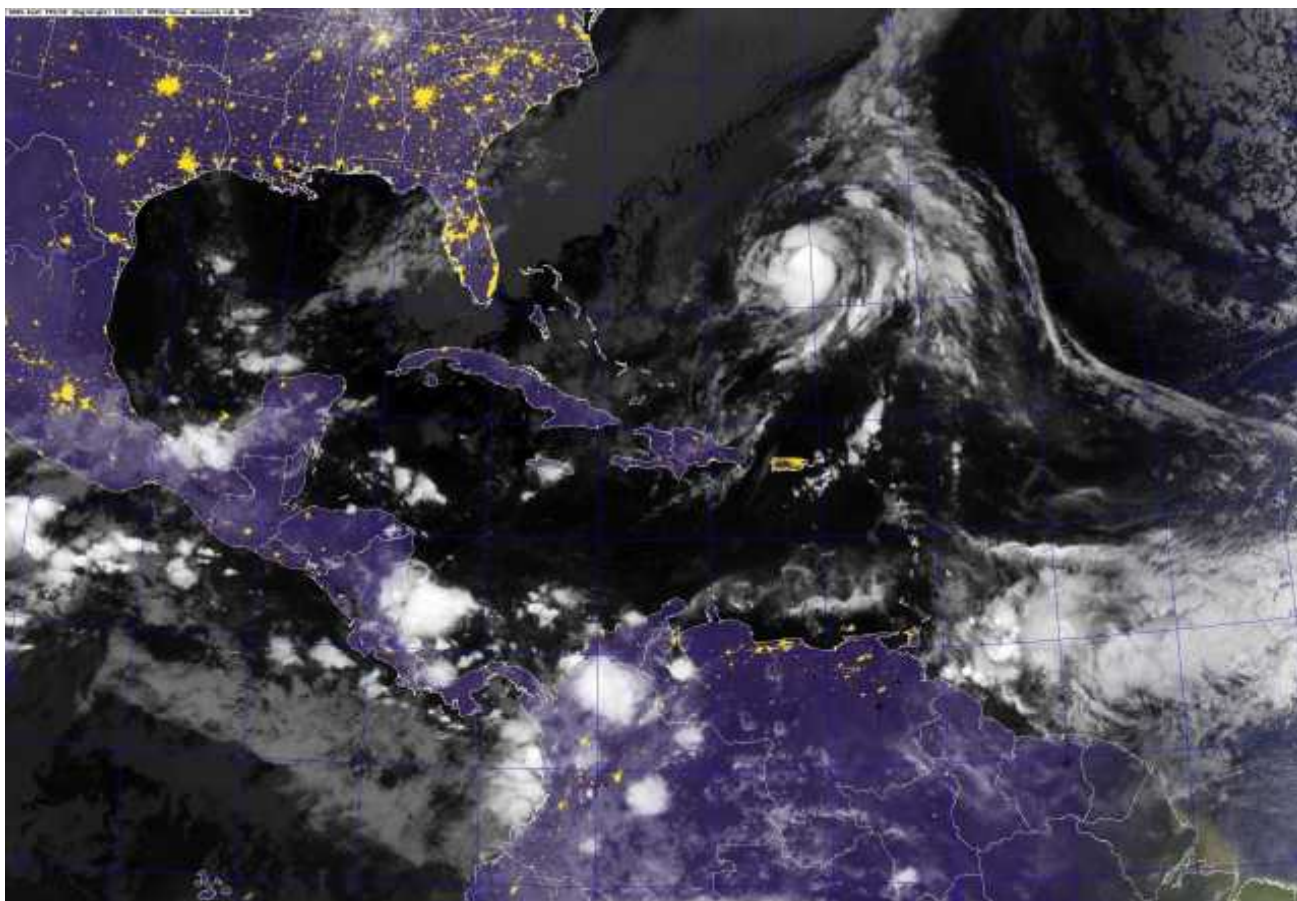
After forming just to the east of the Caribbean 11 days earlier, Hurricane Matthew finally ended its life as a tropical cyclone just off the coast of North Carolina in the USA this weekend. Although Matthew weakened to category 1 on the [Saffir-Simpson Hurricane Wind Scale](#) as it made landfall on Saturday, it produced huge amounts of rain and a significant storm surge to parts of northern Florida, Georgia and the Carolinas. An event total of 467 mm (18.38 inches) rain was recorded near Elizabethtown in North Carolina.

Last week there was some indication from forecast models that Matthew could make a turn to the south and move back towards the Bahamas or Florida this week. However, during the weekend forecasts started to agree that this would not happen. In the event Hurricane Matthew drifted eastwards into the Atlantic and became absorbed into a frontal zone and low pressure area crossing the USA. This combined system is moving north-eastwards and is tracking towards Greenland and Iceland.

Tropical Storm Nicole

Whilst Hurricane Matthew is no longer a tropical cyclone, Tropical Storm Nicole remains [slow-moving in the Atlantic](#) to the south of Bermuda. Nicole did attain hurricane status last Thursday and Friday, but then weakened over the weekend. However, latest predictions suggest that Nicole will again become a hurricane and will start to accelerate north, then north-east. The current forecast track takes Nicole directly over or just to the west of Bermuda on Thursday. This could bring strong winds, heavy rain, storm surge and rip currents to the islands.

Although Bermuda is only around 25 km long at its longest it is in a location which is often threatened by tropical cyclones. In 2015 Hurricane Joaquin passed just far enough to the west of the island to only inflict minor damage. However, in 2014 Bermuda was hit by category 1 Hurricane Fay followed by category 2 Hurricane Gonzalo just six days later. Gonzalo inflicted between \$200 and \$400 million of insured damages in Bermuda, but no deaths or serious injuries were caused.

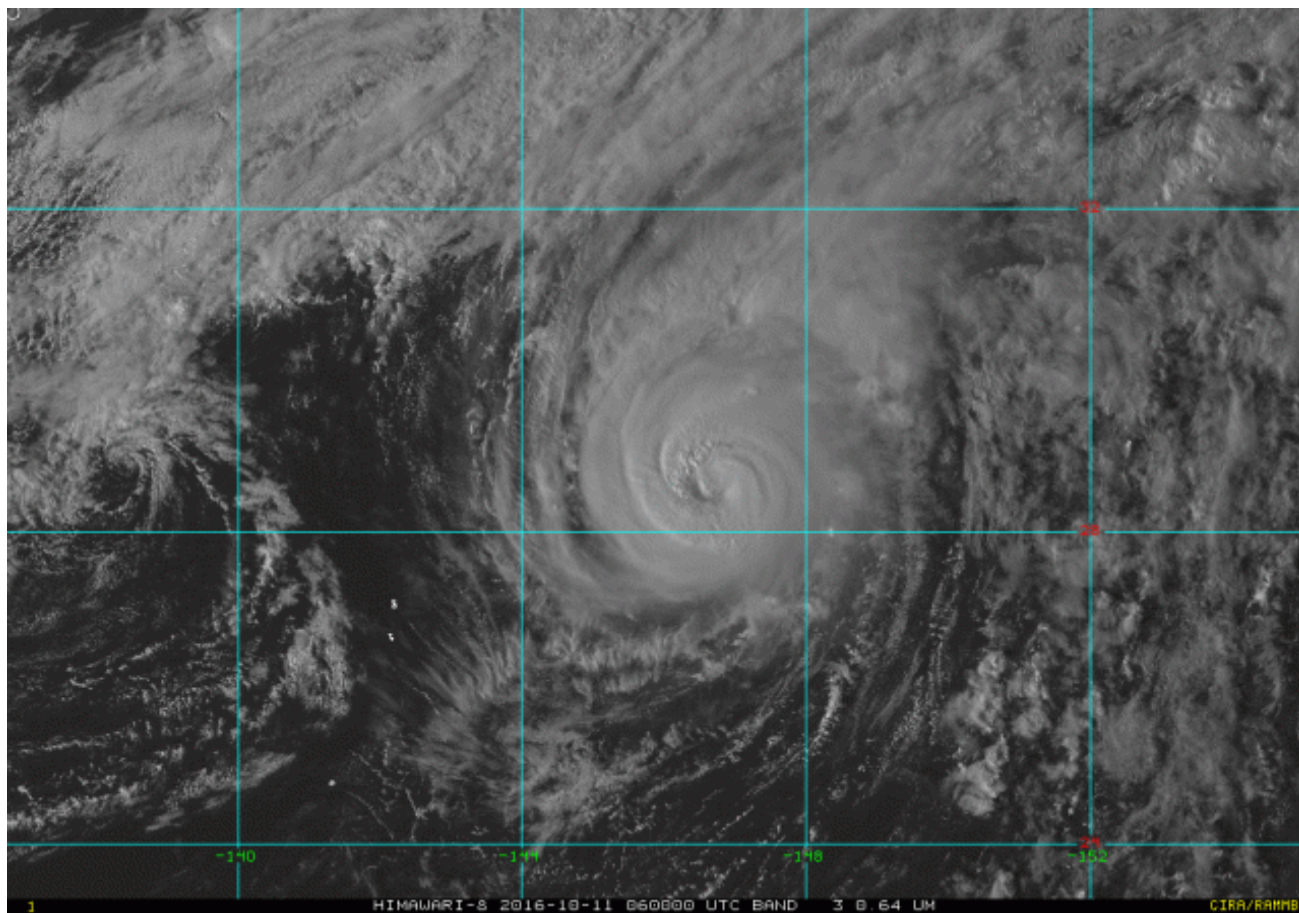


Tropical Storm Nicole 11 Oct 2016. Image courtesy of US Naval Research Laboratory

After passing close to Bermuda Nicole is expected to remain in the central Atlantic for some time. Any progress towards Europe as a post-tropical cyclone is likely to be blocked by an area of high pressure which develops over the Atlantic to the east of the storm.

Elsewhere in the world

Typhoon Songda is located in the western North Pacific far from land and is expected to accelerate north-eastwards away from the tropics in coming days. Although it will not make landfall as a tropical system, current predictions suggest its warmth and moisture could be swept into a deep area of low pressure which will head across the Pacific towards the west coast of North America later this week.



Typhoon Songa 11 Oct 2016. Image courtesy of CIRA/AMMB

Computer models are also agreeing that a typhoon could develop and track towards the central Philippines later this week. The Philippines has had a very quiet typhoon season so far this year with just one (Typhoon Nida) having made landfall as it crossed the north-eastern tip of Luzon.

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Global tropical storms, heavy rain and snow

Description

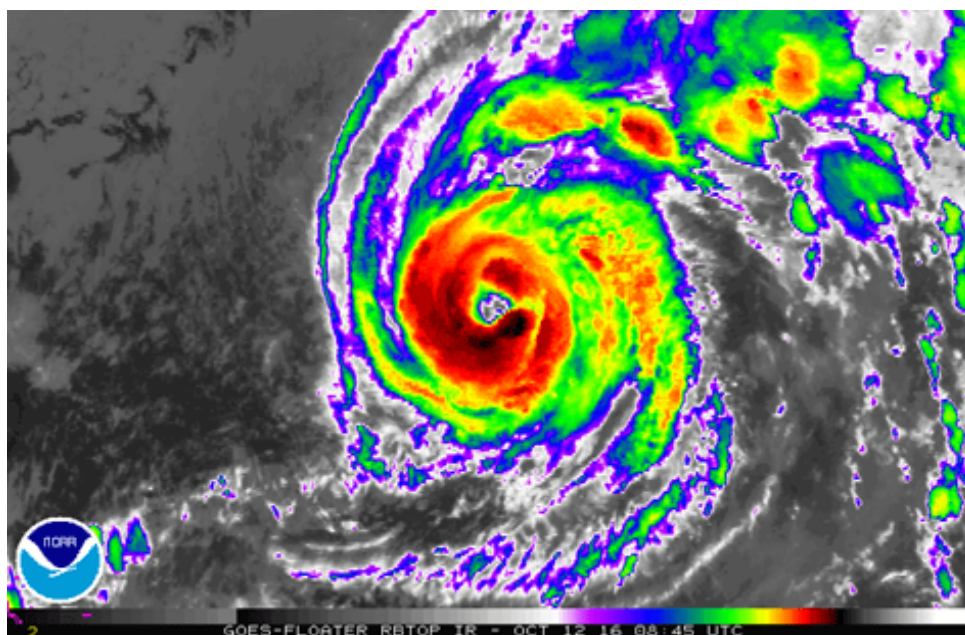
With the weather in the UK still relatively settled we take a look at where the weather may have an impact around the world in the coming days.

Hurricane Nicole in the Atlantic

Since yesterday Nicole, located in the Atlantic to the south of Bermuda, has strengthened and now has sustained winds near 100 mph and is category 2 on the [Saffir-Simpson Hurricane Wind Scale](#). On its current forecast track Nicole is expected to pass directly over or very close to Bermuda on Thursday afternoon (UK time). Some further strengthening is possible before then.

Bermuda was last hit by a hurricane in 2014. In fact it was hit by two within the space of a week. Hurricane Fay was at category 1, but was quickly followed by Hurricane Gonzalo which was category 2 with sustained winds near 110 mph. Gonzalo inflicted between \$200 and \$400 million of insured damages in Bermuda, but no deaths or serious injuries were caused. Further back in time category 3 Hurricane Fabian with sustained winds near 115 mph caused considerable damage on Bermuda in 2003 and was responsible for four deaths. It is possible that Nicole could have wind strengths similar to both Gonzalo and Fabian at its closest approach to Bermuda tomorrow. It will also bring heavy rain, storm surge and rip currents.

After passing close to Bermuda Nicole is expected to remain in the central Atlantic for some time. Any progress towards Europe as a post-tropical cyclone is likely to be blocked for many days by an area of high pressure which develops over the Atlantic to the east of the storm.



Hurricane Nicole on 12 October 2016 (credit: NOAA)

Possible Western Pacific Typhoon

This year's tropical cyclone season in the western Pacific has seen some intense typhoons track towards Taiwan, China and Japan bringing strong winds, storm surge and high rainfall totals. However, the Philippines, which usually experiences several typhoons each year has only had one glancing blow from Typhoon Nida on the north-east tip of Luzon this season.

However, this could change later this week. A tropical depression has formed to the east of the Philippines and forecast models are in agreement that this time the Philippines could be in the firing line. At this stage it is unclear exactly how strong this tropical cyclone could become, but a track across Luzon either on Sunday or Monday is now looking increasingly likely.

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Mediterranean coast – Spain, France, Italy, Southern Alpine region and the Balkans

Some very unsettled weather is expected to develop across much of the western and central Mediterranean region in the next few days. Heavy rain and thunderstorms will increasingly affect Spain today, more especially across the north-east of the country by this evening, including Barcelona. During Thursday and Friday the heavy rain and thunderstorms will then move east to affect southern France, the Southern Alps and northern Italy, and be accompanied by some very strong winds, especially along the Mediterranean coast. Locally 50 to 100 mm, with as much as 125 mm of rainfall is expected per day leading to an enhanced flash flood and landslide risk across the region. We also expect some significant early season snowfall across the Alps above 1500 m. By the weekend the

heavy rain will reach the western Balkans and Greece.

Northwest USA and southwest Canada

A series of active Pacific storm systems are expected to run into the Pacific Northwest of the USA from northern California through Oregon tomorrow, and then extend towards Washington and southwest British Columbia, Canada in the coming 3 or 4 days. Periods of heavy rain are associated with these storms, with as much as 300 to 400 mm of rainfall accumulating in places. Major cities such as Seattle and Vancouver are likely to be affected. Inland, as the rain meets the cold air across Canada the Rockies are likely to see some early season snow. Flash floods and landslides are possible with the heavy rain. In addition, strong to gale force winds are likely, with the potential to damage trees and affect power supplies, with rough seas affecting coastal areas.

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Hurricane Nicole Heading for Bermuda

Description

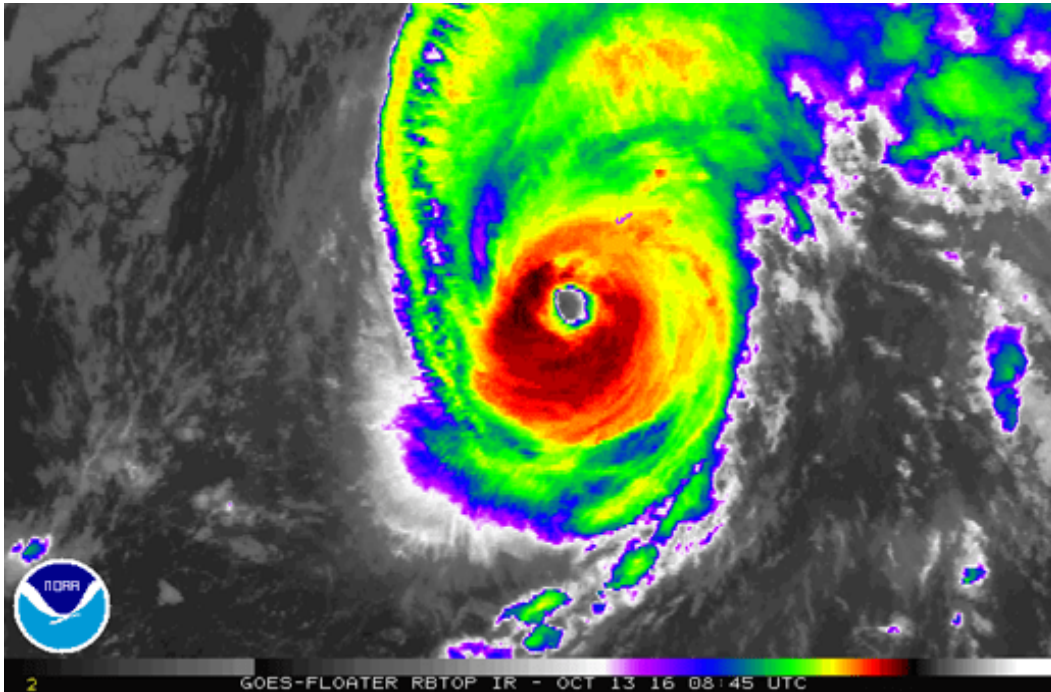
Hurricane Nicole has continued strengthening and is now category 4 on the [Saffir-Simpson Hurricane Wind Scale](#) with sustained winds near 130 mph. It is forecast to pass either directly over or very close to Bermuda later today.

Whilst Bermuda sits in an area which frequently sees tropical storms and hurricanes pass close by, a landfall of such an intense hurricane would be unprecedented. In 2014 Hurricane Gonzalo made landfall with winds near 110 mph. In 2003 Hurricane Fabian did not technically make landfall over Bermuda as the centre of the eye did not cross land. However, Bermuda experienced the strong winds in the eyewall which were estimated near 115 mph at the time. Both of these hurricanes caused considerable damage on Bermuda.

Going further back in time, a hurricane in 1939 had winds strengths of 130 mph and passed within about 80 km of the Bermuda coast. The strongest hurricane on record to pass directly over Bermuda occurred in 1926 with peak winds near 120 mph. Thus if Hurricane Nicole did make landfall over Bermuda at its current intensity, it would be the strongest to do so in a historical record dating back over 160 years.

Heavy rain is already falling over Bermuda with up to 200 mm expected. A storm surge of up to 2 metres is possible with dangerous surf and rip currents.

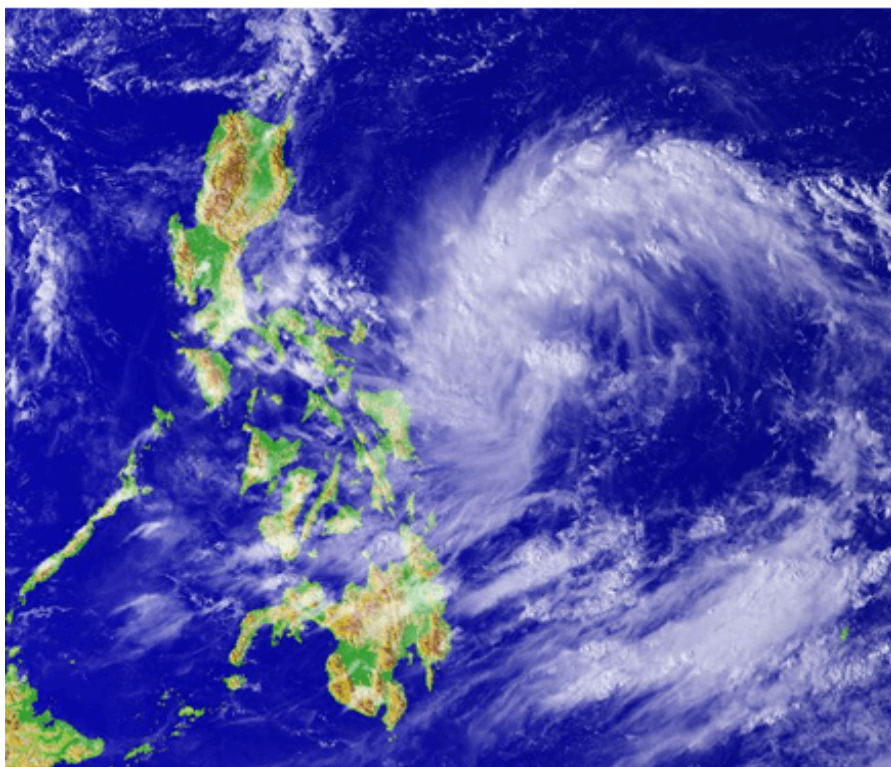
After passing close to Bermuda Nicole is expected to remain in the central Atlantic for some time and become a strong post-tropical cyclone. Nicole is not expected to directly impact the UK and is eventually expected to head towards Iceland. However, it may induce the development of a ridge of high pressure over western Europe next week.



Hurricane Nicole on 13 October 2016 (credit: NOAA)

Possible Western Pacific Typhoon

A tropical depression has formed to the east of the Philippines and is expected to become a tropical storm later today. It will track towards the west and could become a typhoon before making landfall over Luzon at the weekend. Irrespective of whether it attains typhoon intensity it is likely to bring 300-500 mm rain and the potential of flooding to parts of the northern Philippines. Further strengthening is possible early next week as the storm crosses the South China Sea. A second landfall over China or Vietnam is likely by mid-week.



Tropical Depression east of the Philippines on 13 October 2016

(credit: National Institute for Informatics)

Official warnings for the latest tropical cyclones in the North Atlantic are issued by the US [National Hurricane Center](#). In the western North Pacific warnings are issued by the [Japan Meteorological Agency](#). The Met Office routinely supplies predictions of cyclone tracks from its global forecast model to regional meteorological centres worldwide, which are used along with guidance from other models in the production of forecasts and guidance. We also provide updates on current tropical storms via [@metofficestorms](#) on Twitter.

Date Created

October 2016

What's happening to the weather around the globe?

Description

[Europe](#) (not including the UK)

Heavy rain and thunderstorms continue to affect parts of the northern Mediterranean today. Southern France and northwest Italy could see another 50-150mm of rain, following on from similar amounts yesterday (Thursday).

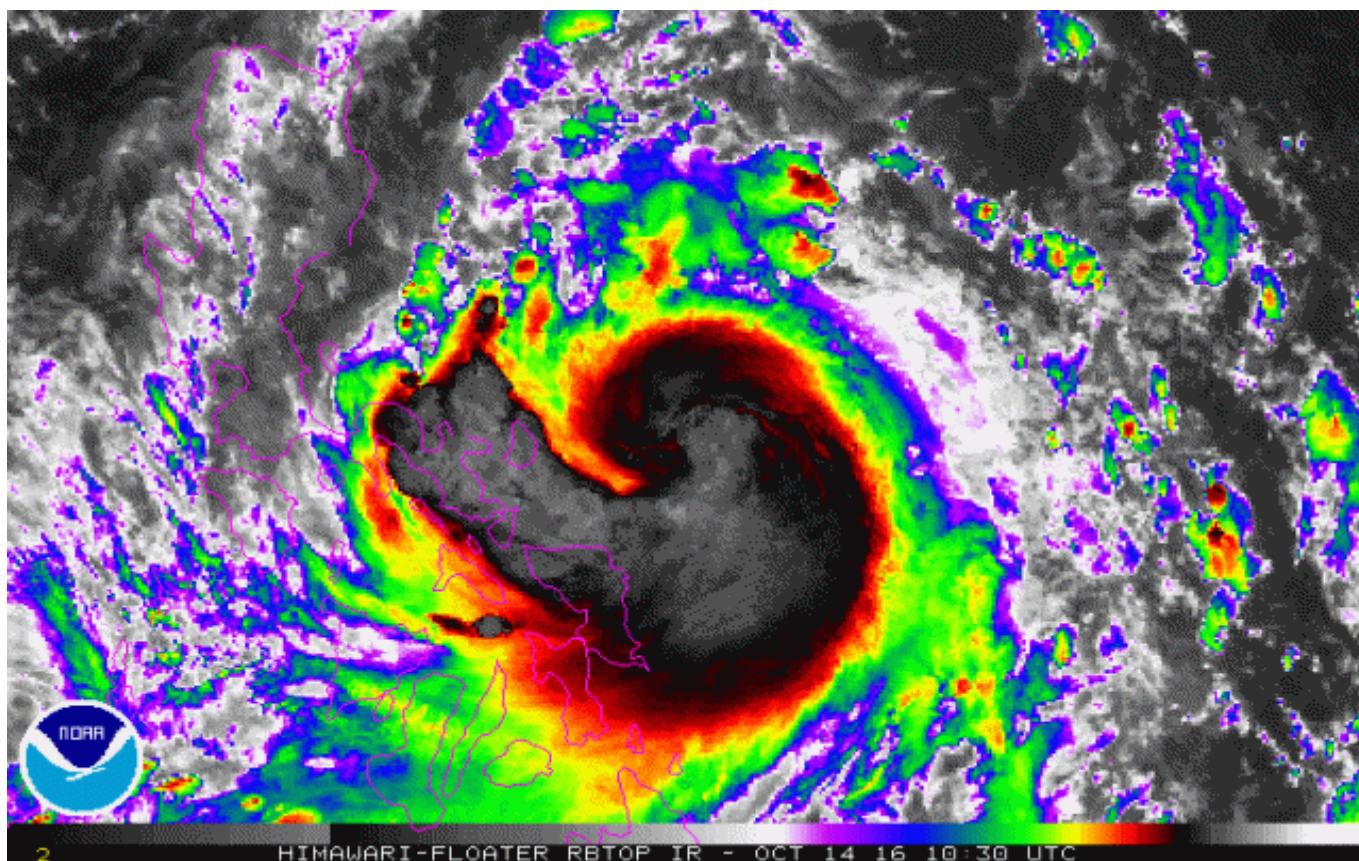
“Red” warnings for heavy rain have been issued for parts of northwest Italy for today, with widespread “Amber” and “Yellow” warnings elsewhere for heavy rain and strong winds

By the weekend the heavy rain is expected to have reached the western Balkans and eventually Greece. The rainfall brings with it an increased risk of flash flooding and landslides, with possible disruption to travel (including aviation) across the region. Strong winds could also disrupt shipping.

Meanwhile, parts of northwest Spain and Portugal are also being affected by rain and could see 50-100mm on both Sunday and Monday, bringing a flooding and landslide risk to the area.

Typhoon Sarika and Hurricane Nicole

Typhoon Sarika is about 370 miles east of Manila in the western Pacific, and is expected to [track](#) across southern and central Luzon today and Saturday. Maximum sustained winds of around 90 mph, with gusts of 125 mph, are expected as it crosses Luzon, bringing 300-500 mm of rain in places. Destructive winds, flash flooding and a significant storm surge is expected.



Typhoon Sarika. Image courtesy of NOAA

Sarika is then expected to move across the South China Sea early next week, potentially reaching Hainan, China and eventually the Hanoi region of Vietnam as a major typhoon by the middle of next week.

Hurricane Nicole passed over Bermuda as a Major Category 3 hurricane yesterday (Thursday), with maximum sustained winds of around 120mph, gusts of around 150mph and 150-250mm of rain.

Widespread loss of power was reported yesterday across the island. Nicole has weakened to Category 1 with gusts to 105 mph and has moved north-east of Bermuda into open waters of the Atlantic. It will continue to track away from the island and gradually weaken as it moves towards the central northern Atlantic, becoming "post tropical" on Saturday.

North America

A series of active Pacific storm systems are expected to run into the Pacific northwest of the USA from northern California through Oregon and Washington to southwest British Columbia, Canada, over the next few days. Locally heavy and persistent rain is likely, with as much as 300 to 400 mm of rainfall accumulating in places.

Major cities such as Seattle and Vancouver are likely to be affected. Cold air to the east means the Rockies are likely to see some early season snow. Flash floods and landslides are possible. In addition strong to gale force winds are likely, with the risk of damage to trees and power supplies, with some large waves likely to affect coastal areas.

Further Information

Official warnings for the latest tropical cyclones in the North Atlantic are issued by the US [National Hurricane Center](#). In the western North Pacific warnings are issued by the [Japan Meteorological Agency](#). The Met Office routinely supplies predictions of cyclone tracks from its global forecast model to regional meteorological centres worldwide, which are used along with guidance from other models in the production of forecasts and guidance. We also provide updates on current tropical storms via [@metofficestorms](#) on Twitter.

Date Created

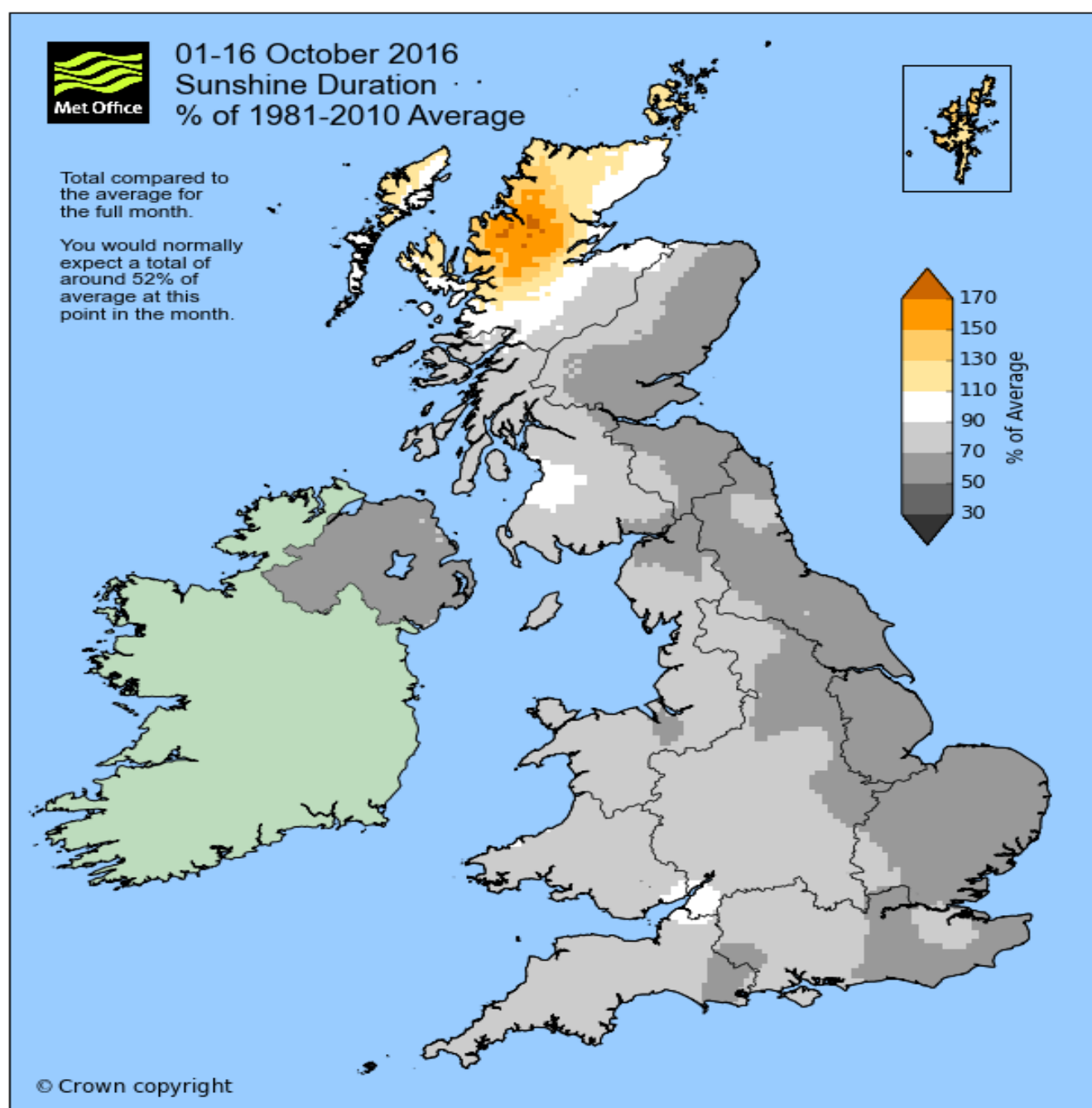
October 2016

October – sunny and dry for many so far

Description

October, so far has been a relatively quiet month with high pressure centred over Scandinavia controlling the weather across the UK for most of the past fortnight.

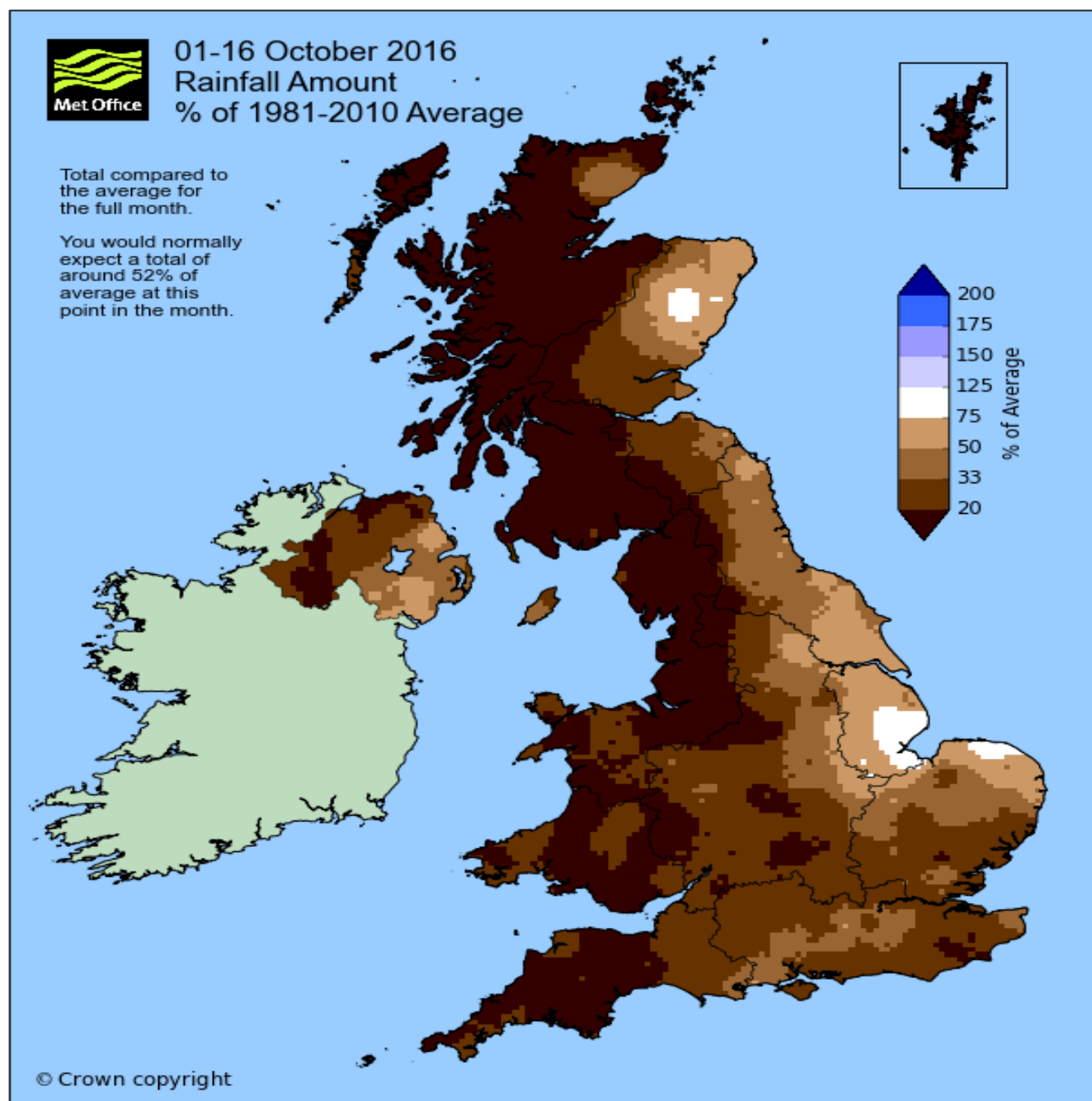
The influence of the [high pressure](#) has meant many places have seen rather dry weather but also a fair bit of sunshine under clear skies



rn
the

As is

typical when high pressure is in charge, rainfall has also been limited with amounts for the UK up until the 16th at 27mm and only 21% of the October average (127.1mm). The anomaly map reveals a similar pattern to the sunshine amounts with rainfall totals in the west of the UK below what you would expect for mid-way through October. Places like Argyllshire, and Ross and Cromarty have so far received less than 10% of October's expected rainfall, with only 21.8mm and 6.7mm recorded, respectively.



1-16 October 2016 Sunshine hours

Rainfall

	Actual	hours	Anm %	Actual mm	Anm %
UK	69.7		75	27.0	21

England	72.4	70	25.3	28
Wales	74.1	80	31.1	18
Scotland	66.1	88	26.8	15
N Ireland	57.6	66	38.2	32

Although this past weekend did see spells of rain for much of the country, the [forecast](#) for the remainder of this week is for colder and drier weather to become established, especially across northern and western parts, as high pressure builds once more. However, later next weekend rain may affect some southern and western parts as temperatures recover closer to [average](#) for the time of year.

You can keep up to date with the weather using our [forecast](#) pages and by following us on [Twitter](#) and [Facebook](#), as well as using our new [mobile app](#) which is available for iPhone from the [App store](#) and for Android from the [Google Play store](#).

Date Created

October 2016

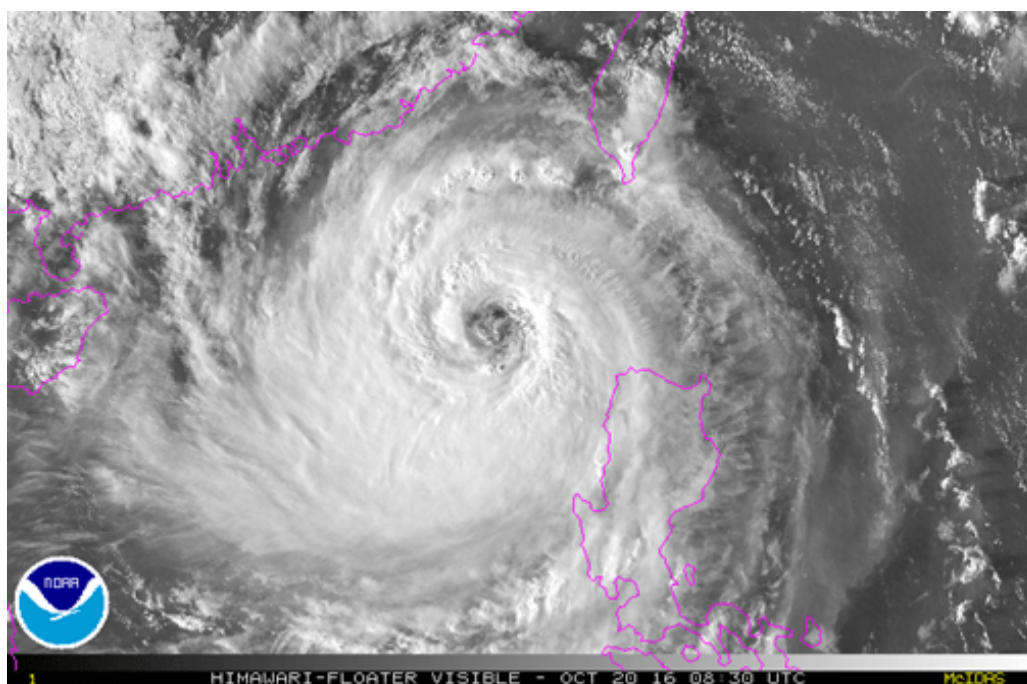
Tropical Weather Updates

Description

Typhoon Haima

Typhoon Haima made landfall yesterday over the Cagayan and Isabela provinces of the Philippines. Haima had reached an intensity equivalent to a category 5 hurricane on the [Saffir-Simpson Hurricane Wind Scale](#) whilst east of the Philippines, but was weakening as it made landfall. Considerable damage has been reported in cities such as Tuguegarao which was in its path.

Having crossed the Philippine island of Luzon, Typhoon Haima has now emerged into the South China Sea. Although in a weakened state, it will still be able to deliver strong winds, a storm surge and 300-500 mm rain when it makes a second landfall over southern China just east of Hong Kong on Friday morning UK time. Haima will weaken to a tropical storm after landfall, but is expected to produce heavy rain across parts of south-east China as it turns north and east. The residual depression could then emerge back out to sea and bring disturbed weather to parts of south-western Japan later in the weekend.



Typhoon Haima on 20 October 2016 (Credit: NOAA)

The Caribbean

Parts of the Caribbean are still dealing with the aftermath of Hurricane Matthew a couple of weeks ago. Matthew devastated parts of Haiti when it made landfall as a category 4 hurricane. In the next few days the ongoing humanitarian effort to assist the recovery is likely to be disrupted by periods of heavy rain

which form along a band of warm moist air stretching from Central America, across the Caribbean Sea and into the Atlantic Ocean. An additional 75-150 mm rain per day is expected over Haiti during the next few days which could produce local flash flooding and landslides.

It is possible that a tropical or [subtropical](#) storm could develop just north-east of the Bahamas in the next day or two at the northern end of this band of warm moist air. This storm is likely to move northwards and merge with another trough of low pressure over the USA to bring some disturbed weather the north-eastern USA and eastern Canada at the weekend.

Elsewhere in the tropics

The cyclone season for the North Indian Ocean usually occurs in two halves from April to June and October to December. There are indications from forecast models that a tropical depression or tropical storm may form in the Bay of Bengal in the next few days. This would be the first storm in the region since Tropical Storm Roanu in May. If it does develop the likely track would take it over or very close to the coast of Myanmar by the latter part of the weekend.

Further Information

Official warnings for the latest tropical cyclones in the western North Pacific are issued by the [Japan Meteorological Agency](#). In the North Atlantic warnings are issued by the US [National Hurricane Center](#) and in the North Indian Ocean by the [India Meteorological Department](#). The Met Office routinely supplies predictions of cyclone tracks from its global forecast model to regional meteorological centres worldwide, which are used along with guidance from other models in the production of forecasts and guidance. We also provide updates on current tropical storms via [@metofficestorms](#) on Twitter.

Date Created

October 2016

Discussion of land ecosystem changes in the IPCC 5th Assessment Report

Description

Climate change is a globally complex issue and there are genuine areas of uncertainty and scientific controversy. However with an increase in record temperatures, the melting of Arctic ice and a rise in CO₂ there is little doubt our climate is changing.

Among the profound impacts of climate change now being investigated is its affect on ecosystems around the globe and the fact the world appears to be getting greener.

These issues, including carbon accumulation in vegetation, have been widely discussed in the scientific literature and official reports.

The Met Office's Professor Richard Betts looks at the coverage of this in the IPCC 5th Assessment Report.

A recent paper ([Zhu et al, 2016](#)), attributed the observed worldwide greening of vegetation largely to the fertilisation effects of increased carbon dioxide. This paper was published after the [IPCC 5th Assessment Report](#) (AR5), but had the issue already been discussed in AR5? Yes – quite prominently and extensively.

The [Summary for Policymakers](#) (SPM) of the Working Group 2 volume on Impacts, Adaptation and Vulnerability features observed land ecosystem changes prominently. The first figure of results in the SPM (reproduced below) gives an overview of observed impacts of climate change, including a number of examples of terrestrial (ie: land) ecosystem changes.



Figure reproduced from IPCC AR5 Working Group 2 Summary for Policymakers

The table accompanying that figure explains each of the impacts depicted on the map. Many of these clearly relate to observed greening across the world.

Region	Examples of observed vegetation increase highlighted in IPCC AR5 WG2 Summary for Policymakers
Europe	➤ Earlier greening, leaf emergence, and fruiting in temperate and boreal trees ➤ Upward shift in tree-line in Europe, beyond changes due to land use ➤ Positive yield impacts for some crops mainly in northern Europe, beyond increase due to improved technology
Asia	➤ Changes in plant <u>phenology</u> and growth in many parts of Asia (earlier greening), particularly in the north and east ➤ Distribution shifts of many plant and animal species upwards in elevation or <u>polewards</u>, particularly in the north of Asia ➤ Advance of shrubs into the Siberian tundra
Australasia	➤ Expansion of monsoon rainforest at expense of savannah and grasslands in northern Australia
North America	➤ <u>Phenology</u> changes and species distribution shifts upward in elevation and northward across multiple <u>taxa</u>
Polar regions	➤ Increased shrub cover in tundra in North America and Eurasia ➤ Advance of Arctic tree-line in latitude and altitude ➤ Increased plant species ranges in the West Antarctic Peninsula and nearby islands over the past 50 years
Small Islands	➤ Upward trend in tree-lines and associated fauna on high-elevation islands

Text reproduced from IPCC AR5 Working Group 2 Summary for Policymakers

As well as being highlighted in the SPM, these changes and the processes behind them – including

carbon dioxide fertilisation – are also discussed in several chapters of the main report. This includes the chapters on Terrestrial and Inland Water Systems (Chapter 4); Food Security and Food Production (Chapter 7); Detection and Attribution of Observed Impacts (Chapter 18); and most of the chapters on individual regions (Chapters 21-30). Some examples include:

- Terrestrial and freshwater ecosystems have sequestered about a quarter of the carbon dioxide (CO₂) emitted to the atmosphere by human activities in the past 3 decades – [Chapter 4](#), Executive Summary. There is high confidence that the factors causing the current increase in land carbon include the positive effects of rising CO₂ on plant productivity, a warming climate, nitrogen deposition, and recovery from past disturbances, but low confidence regarding the relative contribution by each of these and other factors – [Chapter 4](#), Executive Summary.
- Evidence since AR4 confirms the stimulatory effects of carbon dioxide (CO₂) in most cases – [Chapter 7](#), Executive Summary. Across all climate zones and continents, the major role of climate change and increasing atmospheric carbon dioxide (CO₂) on terrestrial and freshwater ecosystems has been confirmed by new and stronger evidence – [Chapter 18](#), Executive Summary.
- Basal area measurements at more than 150 plots across the tropics suggest that biomass and growth rates in intact tropical forests have increased in recent decades (Lewis et al., 2009). This is also confirmed for 55 temperate forest plots, with a suspected contribution of CO₂ effects (McMahon et al., 2010). Satellite observations analysed in Donohue et al. (2013) suggest that an increase in vegetation cover by 11% in warm drylands (1982–2010 period) is attributable to CO₂ fertilisation. – [Cross-Chapter Box VW](#) (page 158).
- Satellite observations from 1982–2010 show an 11% increase in green foliage cover in warm, arid environments (where WUE is most important) after correcting for the effects of precipitation variability (Donohue et al., 2013); gas exchange theory predicts 5 to 10% greening resulting from rising CO₂ over this period – [Chapter 4](#) section 4.2.4.4.
- Carbon dioxide (CO₂) is an essential building block of the process of photosynthesis. Simply put, plants use sunlight and water to convert CO₂ into energy. Higher CO₂ concentrations enhance photosynthesis and growth (up to a point), and reduce the water used by the plant. This means that water remains longer in the soil or recharges rivers and aquifers. These effects are mostly beneficial; however, high CO₂ also has negative effects, in addition to causing global warming. High CO₂ levels cause the nitrogen content of forest vegetation to decline and can increase their chemical defences, reducing their quality as a source of food for plant-eating animals. Furthermore, rising CO₂ causes ocean waters to become acidic (see FAQ 6.3), and can stimulate more intense algal blooms in lakes and reservoirs – [Chapter 4](#), Frequently Asked Question 4.2.

In summary, there is high confidence that net terrestrial ecosystem productivity at the global scale has increased relative to the pre-industrial era. There is low confidence in attribution of these trends to climate change. Most studies speculate that rising CO₂ concentrations are contributing to this trend through stimulation of photosynthesis, but there is no clear, consistent signal of a climate change contribution – [Chapter 4](#).

The [final draft](#) of the main report was [released on the same day](#) as the SPM.

The issue of land carbon uptake and increased biomass were also discussed in the Working Group 1 volume on The Physical Science Basis, both in that volume's SPM and the chapter on Carbon and

Other Biogeochemical Cycles.

Recent suggestions that this issue was downplayed in IPCC AR5 are therefore incorrect and misleading.

Date Created

October 2016

Will you see the Aurora borealis this week?

Description

Over the past few nights, clear skies have allowed skygazers in some parts of the UK to see the Aurora borealis (or [Northern Lights](#)). In particular, northern parts of Scotland have been treated to some stunning displays.

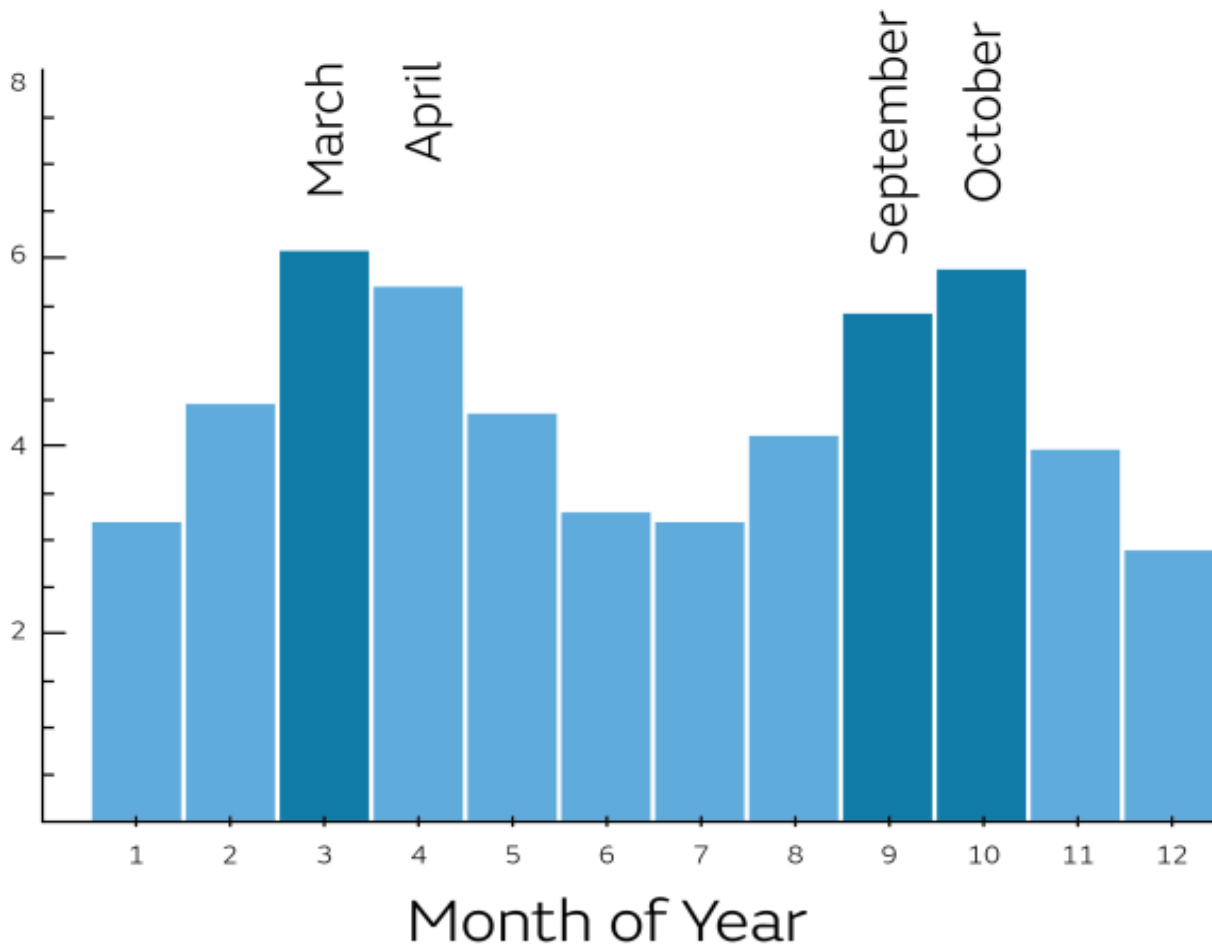
[#aurora](#) [#Auroraborealis](#) [#northernlights](#) [#Stormhour](#) [#skye](#)

And there it was once again, The Aurora Borealis Dancing Through The sky.
pic.twitter.com/XiAWpv6P4C

— The Whitby Photographer (@WhitbyPhotos) [October 25, 2016](#)

During autumn and spring the chances of seeing this phenomenon is increased due, in part, to the angle of the magnetic poles in conjunction with the magnetic orientation of the solar wind. This results in enhanced geomagnetic activity, leading to increased chance of seeing aurora in the UK compared with winter and summer.

Average Number of Geomagnetically Disturbed Days 1932 - 2007

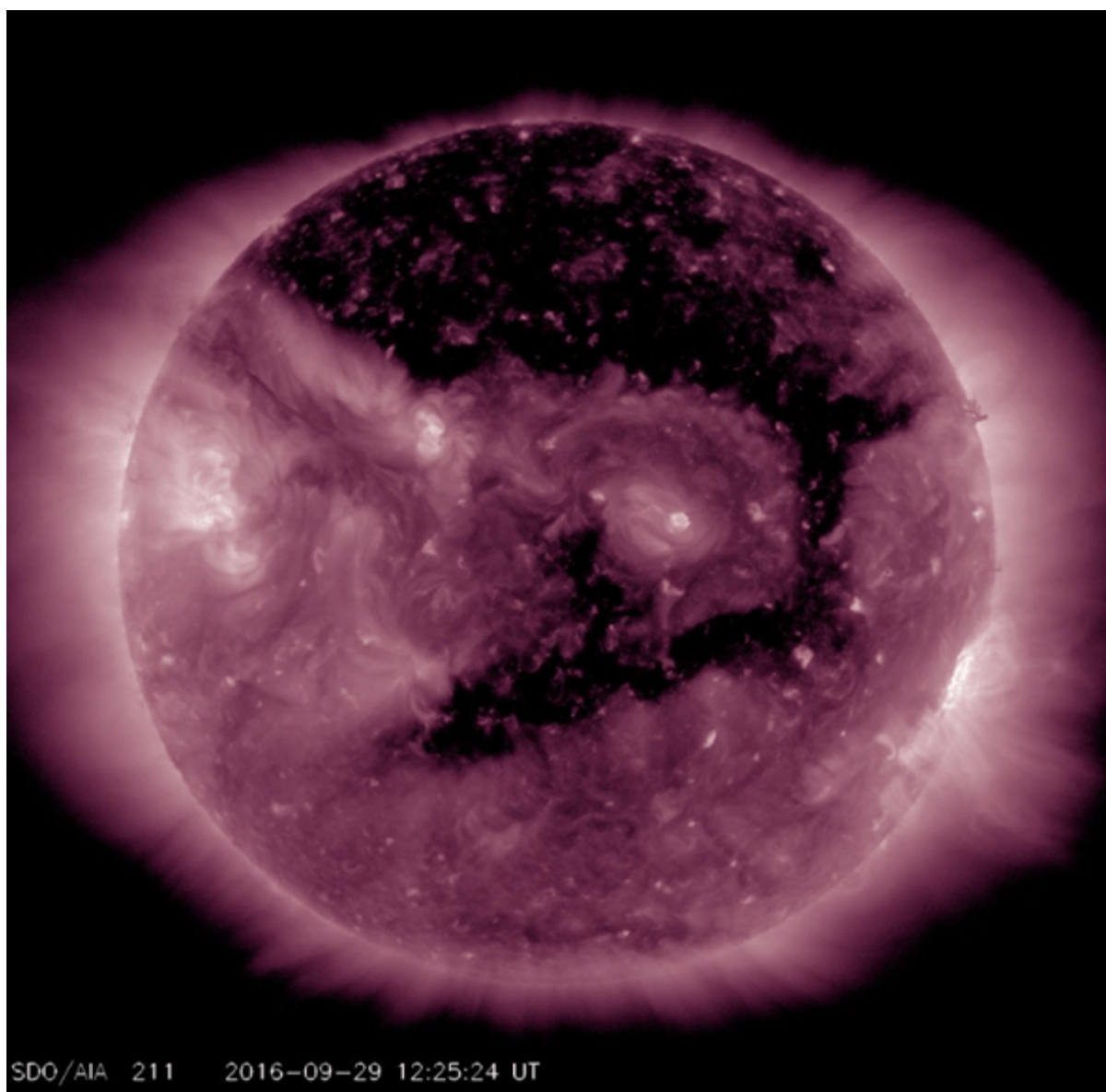
**Why****now?**

There is an [additional factor](#) leading to an increase in the chance of seeing the Northern Lights at the moment.

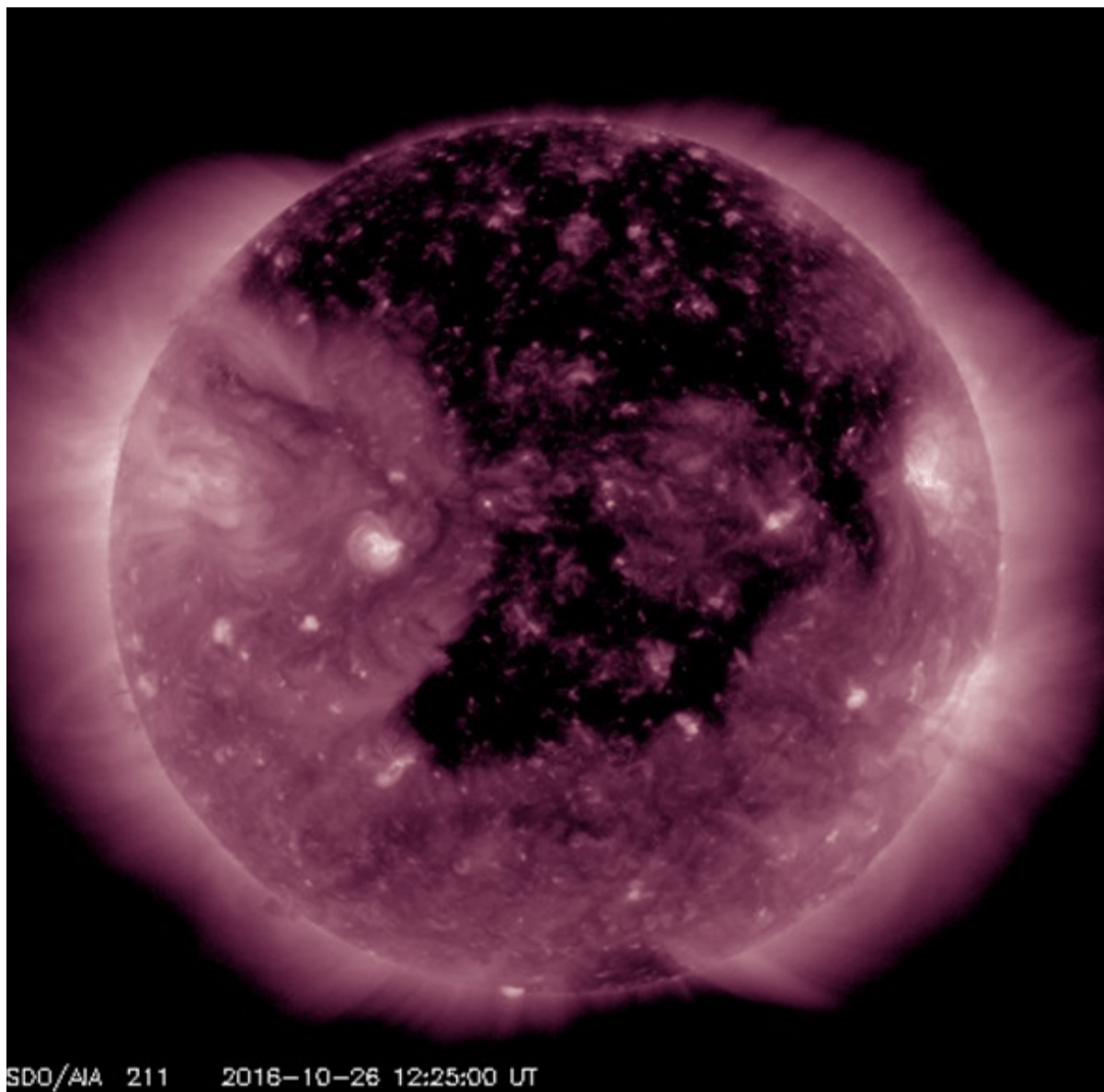
The Sun goes through an 11 year solar cycle, from solar minimum, through solar maximum and back to solar minimum. We are now in the declining phase of the solar cycle following the solar max which occurred in early 2014. During the current phase of the solar cycle coronal holes that begin the cycle in the Sun's 'polar' regions have now migrated towards the Sun's equator, meaning they are on a similar line of latitude to the Earth (i.e. facing the planet rather than directed north and south out of the solar system). These coronal holes give rise to high speed solar wind streams that buffet the Earth, disturbing its magnetic field.

In other parts of the solar cycle these disturbances are largely as a result of coronal mass ejections, which can give larger magnitude disturbances than these high speed streams.

In late September 2016 a coronal hole led to the Aurora borealis being seen as far south as Lancashire along the northern horizon. This same hole has since rotated 360 degrees around the sun and is now in a similar position but has grown in size. The dark area on the images below show this coronal hole from late September and today (26 October 2016).



Coronal holes (dark regions) as seen on 29 September 2016. Image courtesy of NASA



Larger coronal holes as seen on 26 October 2016. Image courtesy of NASA

The strength of the disturbance directly relates to how far south the aurora is visible (or how far north if you are in the southern hemisphere), and of course you need [clear skies](#) to see it.

Assuming clear, dark skies, the aurora should be visible with the naked eye on the northern horizon from much of Scotland and Northern Ireland and possibly into northern England. Parts of Aberdeenshire may have the best chance of viewing the displays this week, with clearer skies than further west. Further south across the UK it may be possible to capture pictures of the aurora while facing the northern horizon with the use of long exposures on cameras.

Keep an eye on our space weather forecasts [here](#) and follow us on Twitter @MetOfficeSpace, if there's a chance of seeing the aurora in the UK we'll let you know.

The Met Office works closely with the [British Geological Survey](#) in Edinburgh to forecast these geomagnetic events and the BGS website provides to the minute information on the current activity

levels as well as [‘Tips on viewing the aurora’](#). The BGS website includes a display of the aurora forecast model which is run by the [NOAA Space Weather Prediction Centre](#), we are working on implementing this model at the Met Office.

Let’s hope for clear skies and plenty of beautiful displays – if you are one of the lucky ones let the scientists know by tweeting about it on [Geosocial aurora](#).

Date Created

October 2016